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SOCIO-ECONOMIC IMPACT OF TRAFFIC CONGESTION –A CASE STUDY OF CHITTAGONG CITY

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ABSTRACT

In modern period, traffic problem is one of the most challenging and complex issues in major cities. Chittagong city, commercial capital of Bangladesh is not escaped from this problem. Due to the rapid growth of population and industrialization, the city has been extended exponentially without proper planning. As a result, there has been a disproportion between traffic supply and demand, which leads to intolerable traffic flow problems. Traffic congestion is one of the impediments for the efficient of a road network. It results in massive delays, a decrease in productivity and a bad impact on overall economic growth. Hence, the present study is to find out the pivotal causes of traffic congestion at Chittagong city. It also includes the ill-effects due to traffic congestion and possible remedial measures of traffic jam. Physical observations have been done at different intersections in Chittagong city and identified the causes regarding traffic congestion such as illegal parking on street, unplanned stoppage on road, excessive vehicles of different speed on the same road, road development activities & traffic mismanagement etc. It has also been continued through field investigation for space occupied by illegal parking, social survey and satisfaction report. Due to traffic congestion, ill impacts on the environment, health, social life, economy, and communication systems have been determined. Finally, from the result of the study, some remedial measures have been proposed to achieve effective traffic movement.

Keywords: *Traffic congestion, Chittagong city, Index of satisfaction, Bad impacts, Measures.*

1. INTRODUCTION

Urbanization, a global phenomenon, is taking place rapidly in the developing countries like Bangladesh. Rapid growth of urbanization and industrialization have brought about extreme levels of traffic congestion within the country. Bangladesh is the 10th most densely populated country in the world having 1152 people per square kilometer (World Population Review 2018). As a result, to cope with the growing public demand, number of traffic is increasing exponentially day by day. Now a days, the traffic problem has become a talk of the town and sensitive issue to the living people of Bangladesh (K.D.A, 2008). According to the Osman (2010), traffic congestion eats up around 5 million working hours every day and causes an annual loss of USD 03 billion. A developing nation like Bangladesh cannot bear up the huge losses stemmed from this severe traffic problem (Naznin at. el., 2010).

Chittagong city is not only the principal city of Chittagong division but also the second largest city of Bangladesh. The total population of Chittagong city is near about 6 million. As a result, large number of various vehicles are increasing rapidly due to expansion of urbanization, commercial activities and industrial development in the city (BBS 1981, 1991). Day by day vehicles are increasing very fast in this city but the transport network of this city is not expanding as per the population growing and demand. This expiation of population converts the dwellers life to stagnant situation during the rush hours of morning and evening owing to traffic gridlock. Some problems have been identified in the congested areas.

When buses and trams are stuck in traffic jams they fall behind schedule and this means that more people will be waiting at the next stops, they fall even further behind schedule leading to bunching and compounding delays (Jain & Vazirani, 2010). A common scene of huge traffic jam in Kaptai Rastar Matha in Chittagong has been shown in Figure 1a.

Wasted fuel increases air pollution by emitting Carbon-di-oxide and other poisonous gases (Levi et al., 2010). The noise pollution causes stress in most people and lead to many life-threatening medical conditions such as cardiovascular diseases and blood pressure related ailments. Emission from a private microbus has been shown in Figure 1b.

Disruption of traffic movement arises due to traditional water logging problem caused by tidal flow or heavy rainfall. Normal traffic movement is hampered creating traffic jam in Hat-Bazar area and people lose their valuable time that can be easily understood by Figure 1c.

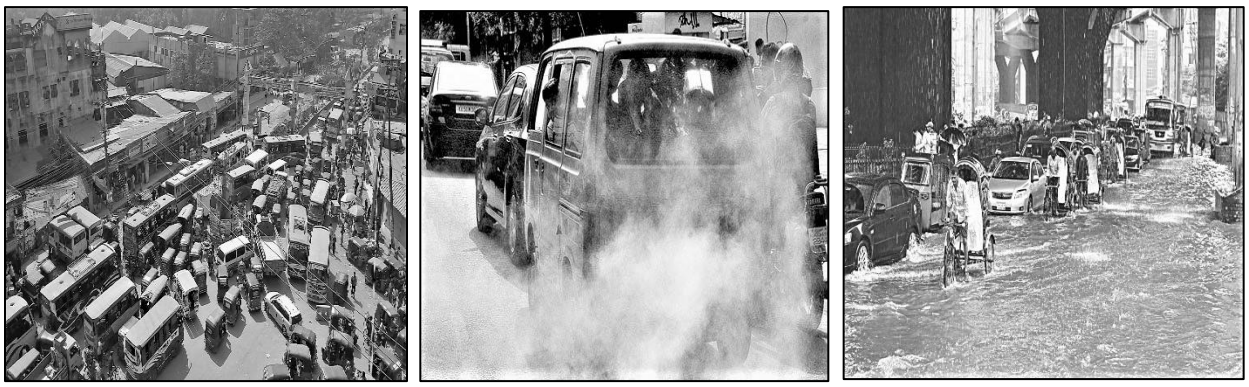


Figure 1a, 1b, 1c: Different sorts of problems faced by road users during traffic congestion

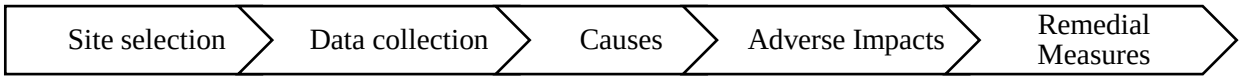
Therefore, this study tries to find out the causes and effects of traffic jam in major intersection points of Chittagong city and how it can be managed from the road user's perspective. The following research question guided this study (Agyapong & Ojo, 2018):

1. What are the main causes of traffic jam in Chittagong city?
2. What do you think about the degree of congestion in the city?
3. What are the bad impacts of traffic congestion in Chittagong city? and
4. Which period traffic congestion is mostly occurred in the city?

Studies will help improve on controlling traffic congestion in the big cities in Bangladesh and play a major impact on policy making. The findings of this studies might help to drivers, pedestrians, shoppers, and traders in the city. It will help explain the major causes of traffic jam and provide some remedial measures for managing this problem.

2. METHODOLOGY

The whole methodology of the study can be divided into a number of steps which can be summarized as cited in the following flow chart:



2.1 Site Selection

Chittagong is the principal seaport of the country. It is estimated population about 6 million, male 50.4%and female 49.6%. At present traffic jam is a common scenario in Chittagong city. The city people are suffering much due to traffic jam. Local people have regularly experienced traffic jam on most of the city roads, including New Market, Bahhadarhat, Chawk Bazar, Andarkilla, Agrabad, Terri Bazar, Dewanhat, Muradpur, 2 no gate and Jamal Khan mainly between 9:00am and 11:00am and between 4:00pm and 6:00pm. So, our physical investigation such as social survey, loss of time calculation etc have been done in these important intersection point.

2.2 Data Collection Procedures

The research consists of both primary and secondary data. Primary data were collected from reconnaissance survey and field survey. On the other side, secondary data were gleaned from various sources on overall status of traffic condition. For the primary source of the information, 200 questionnaires were surveyed in the study area with a questionnaire prepared on the basis of different aspects of traffic congestion after through study of relevant literature. Tabulation and data processing were done both by the hand and computer by using MS Excel. Finally, collected data were analyzed and presented tabular format.

2.3 Selection of the Individual Respondents

In the present study respondent are three types such as passengers 44.67 %, pedestrian 34 % and driver 21.33 %. Age structure of the respondents, young and middle aged (15-49 age structure) group are 77.33 % on the other hand 22.67 % respondents are old aged (46-60 age structure) group.

2.4 Index of Satisfaction

To determine the limit of satisfaction and dissatisfaction of the causes of traffic congestion variables by the respondents, the following satisfaction index developed by Hall, Yen and Tan (1975) is selected

$$Is = (fs-fd)/N \quad (1)$$

Where, Is = satisfaction Index, fs = Number of Satisfied Respondents, fd = Number of dissatisfied Respondents, N = Total number of Respondents

For this satisfaction index, *Is* = +1, meaning highest level of satisfaction and *Is*= -1, meaning highest level of dissatisfaction. In these cases, the negative index of satisfaction was taken to select causes of traffic congestion.

The above satisfaction index has been previously used by Hossain, 1995, Hasan, 1999, Rahman and Islam, 2001 to determine the satisfaction index of respondents of various income groups.

2.5 Loss of Time

During the calculation of loss of time, average journey time and average journey speed are required. For calculating average journey speed (V) we used the following formula:

$$V=d/\bar{t} \quad (2)$$

Where, d =total distance, $\bar{t}$ =average journey time

3. 3 PHYSICAL INVESTIGATION

3.1 Causes of Traffic Congestion

Most of the people believe that traffic congestion is mainly happened due to the increasing rate of population growth. In reality there are several other reasons behind this problem. These are following-

- ✓ Unplanned stoppage and Parking shown in Fig 2a
- ✓ Traffic rules violation by the road users.
- ✓ Carelessly placing construction materials on road shown in Fig 2b
- ✓ Water logging and dumping of waste materials on streets
- ✓ Inadequate traffic management and inefficient traffic police
- ✓ Lack of knowledge of driving and proper training
- ✓ Closure of one way road without any notice which is shown in Fig 3a
- ✓ Motorized and non-motorized vehicles on the same road shown in Fig 3b
- ✓ Queuing of CNGs and cars on the roads
- ✓ Lack of foot over bridges and under passes and unused of foot over bridges

Figure 2a, 2b: Traffic mismanagement due to illegal parking and construction materials on road


Figure 3a, 3b: Traffic jam owing to road closing and vehicles variation on same road respectively

3.2 Adverse Impacts of Traffic Congestion

The bad impact of traffic congestion on Chittagong City can be discussed in three ways. They are –
a. Impact on Economy
b. Impact on Health
c. Impact on Environment

3.2.1 Impact on Economy

Traffic congestion causes an adverse impact on economy in Chittagong city. For this traffic congestion, a huge amount of money is being daily compensated in many ways-

- Losing working-hours
- Extra transportation cost
- Vehicle operating and maintenance cost
- Extra fuel cost
- Miscellaneous cost

Two investigations have been done at between Bahaddarhat and Barik building, Bahaddarhat and New market to find out the percentage of loss of time as well as working hour that causing impact on our economy.

Table 1: Determination of Journey speed and Running speed between Bahaddarhat and Barik Building

Origin	Destination	Distance (km)	Travel time(sec)	Delay time(sec)	Journey speed(kmph)	Running speed(kmph)
Bahaddarhat	Muradpur	1.1	238	18	16.68	18.0
Muradpur	2 no gate	1.1	1100	730	3.6	10.70
2 no gate	GEC	0.9	202	11	16.04	16.96
GEC	WASA	1.0	171	21	21.05	24.0
WASA	Tigerpss	1.1	180	46	22.0	29.6
Tigerpass	Agrabad	1.7	370	79	16.54	21.03
Agrabad	Barik building	0.85	116	8	27.40	28.33

Table 2: Determination of Journey speed and Running speed between Bahaddarhat and New market

Origin	Destination	Distance (km)	Travel time(sec)	Delay time(sec)	Journey speed(kmph)	Running speed(kmph)
Bahaddarhat	Chawk bazar	1.6	401	105	14.40	19.5
Chawk bazar	Andarkilla	1.8	393	92	16.50	21.53
Andarkilla	Katwali circle	1.0	298	1089	12.1	18.95
Katwali circle	New market	.55	114	32	17.40	24.12

The local transport speed in city is not more than 40 kmph whereas we have mostly found the speed of the vehicles between 15-25 kmph. So, the percent loss of time in city is given below.

Table 3: Percent of loss of time

Junction	Distance (km)	Local vehicle speed (kmph)	Local vehicle journey time(min)	Average journey speed (kmph)	Average journey time(min)	Loss of time (min)	Percent loss of time (%)
Bahaddarhat-Barik building	7.75	40	11.63	17.75	26.2	14.57	55.6
Bahaddarhat-New market	4.95	40	7.43	15.1	19.2	11.77	61.3

So, it is seen that 50-60% of time loss due to traffic congestion of a person. It causes a great impact in our economy.

3.2.2 Impact on Health

Traffic congestion has a negative health impact on the city dwellers. General people suffer from many problems such as headache, mental stress, breathing problem, tiredness, eye-sight problem, heart disease, dehydration, hearing complexity, dust allergy, suffocation, and respiratory complication. Besides, vehicles operators are also getting into trouble of some other problems such as- back-pain, excessive breathing and sweating etc.

3.2.3 Impact on Environment

Traffic jam is also accountable for environmental contamination. Due to traffic congestion, environment is polluted in different ways such as noise pollution, air pollution, water pollution etc. Air pollution is mainly triggered by traffic jam. The vehicles get struck in the congestion and at that time vehicles emit gases like COx, SOx, NOx etc. These gases are liable for air contamination. Noise pollution is considered as one of the major threatening issues in urban areas. It is seen that the large number of vehicles is being struck on the roads for a long period of time. As a result, they use horn more and more to get of this problem.

3.3 Social Survey Report

Social survey is based on through questionnaires among the road users including passengers, pedestrians and drivers. These survey works are categorized in five different ways such as major causes of traffic jam, degree of congestion, time variation of congestion, different problems created by traffic jam, satisfaction levels on traffic jam which are shown in the following tables.

Table 4: Major causes of traffic congestion in the study area

Type of Causes	Frequency	Percentage	Rank
Illegal parking and Stopage	63	31.5	1
Absence of traffic law enforcement	42	21.0	2
Road construction around the year	34	17.0	3
Absence of signaling system	19	9.50	4
Lack of driver's training and over taking tendency	16	8.0	5
Different speed vehicles in the same road	14	7.0	6
Absence of footpaths and planned road network	12	6.0	7
Total	200	100	

Table 5: Degree of congestion in Chittagong city

Degree of congestion	Frequency	Percentage(%)
Heavy	105	52.5
Moderate	74	37.0
Light	21	10.5
Negligible	0	0.0
Total	200	100.0

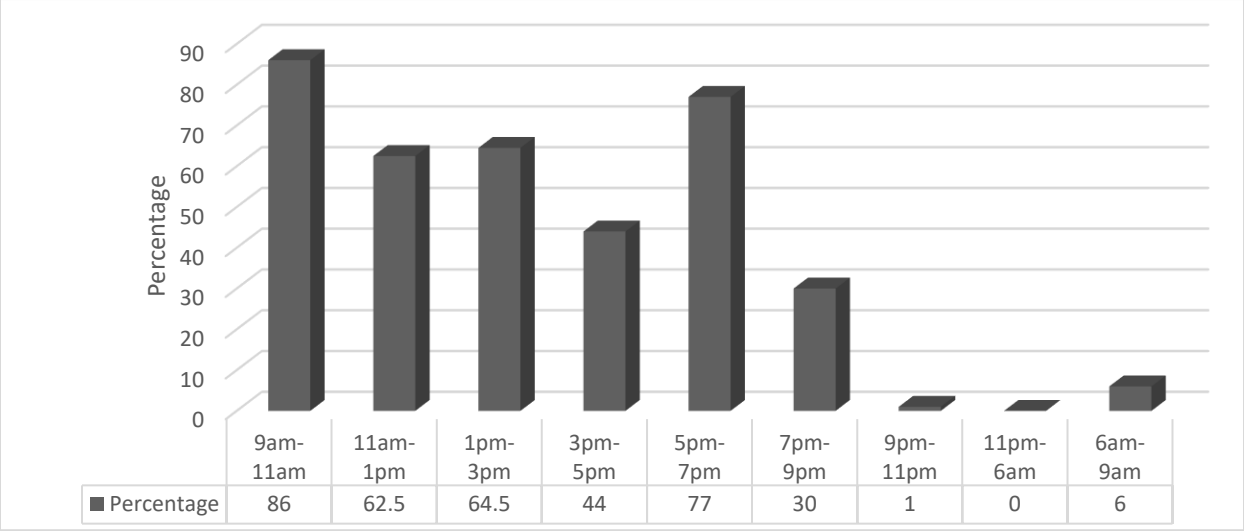


Figure 4: Time variation of traffic congestion in Chittagong

From the above figure, 86 % of participator of the survey thinks that traffic congestion is mostly occurred during the office hour between 9am -11am. It also happens severely returning from office between 5pm-7pm. Besides, Chittagong city is the port capital city of our country. Various vehicles like truck, container and heavy lorry are incoming 7 outgoing in 5pm to 7pm time schedule. At this time, traffic volume on roads is maximum.

Table 6: Different problems created due to traffic congestion in Chittagong city

Nature of problem	Frequency	Percentage
Air pollution	183	91.5
Noise pollution	162	81.0
Waste of time	158	79.0
Waste of Money	129	64.5
Water pollution	117	58.5
Accident	95	47.5

Table 7: Satisfaction level and ranking on traffic congestion in Chittagong city

Usable system	Satisfactory (%)	Averag (%)e	Unsatisfactory (%)	Index of Satisfaction	Ranking
Road surface	19.5	48.5	32.0	-0.125	1
Traffic signals	8.5	57.5	34.0	-0.255	2
Traffic signals and marking	26.0	52.5	52.5	-0.365	3
Adequate traffic police	20.5	28.5	51.0	-0.305	4
Trained drivers	14.5	40.0	45.5	-0.31	5
Adequate footpath	15.5	33.5	51.0	-0.36	6
Road width	15.5	32.5	52.0	-0.365	7
Pedestrians facilities	15.5	32.0	52.5	-0.37	8
Enforcement of traffic rules	16.0	30.0	54.0	-0.38	9
Parking facilities	10.5	33.5	56.0	-0.46	10

All of the criteria involving transportation system and management of the study area are unsatisfactory. Among them, the worst condition was for parking facilities (-0.46) followed by enforcement of traffic rules (-0.38) and pedestrians facilities (-0.37). On the other hand, relatively better condition was for road surface (-0.125). So, it can be expressed that the overall quality of transportation system in the study area is not satisfactory.

4. CONCLUSIONS AND RECOMMENDATION

From the study, it can be concluded that the ranked causes of traffic jam are mainly illegal parking and stoppage, absence of traffic law enforcement, lacking of coordination between road construction authorities, absence of signaling system etc. The effects of traffic jam are mainly indispensable loss in productivity, huge contamination in environment, time-consuming and adverse consequences on human health etc. Now time has come to take integrated planning, implementation and management of traffic system. Some specific recommendations for reducing traffic congestion from the Chittagong city are given bellow.

- ✓ Since the satisfaction index for parking facilities is maximum shown in Table-, it's the foremost duty to stop the parking of vehicles here and there and to provide sufficient specific parking area surrounding the city.
- ✓ The above study indicates that there is deficiency of proper footpath for pedestrian's movement. So adequate number of footpath has to be constructed along with the major roads in the city.
- ✓ Most of the traffic jam occur between 9-11 am during office hour shown in Fig 4. So different organization might follow different time schedule to disperse the traffic volume on roads in different time interval.

- ✓ Since there is not sufficient number of traffic police at the most intersection point on the roads, movement of traffic cannot be controlled strictly. So presence of adequate number of police has to be ensured at major intersection points.
- ✓ Moreover, some measures such as creation of public awareness, inception of public transport service, execution of traffic rules and regulation strictly, decentralization, banning of unauthorized parking etc. can reduce the problem to a great extent.

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