Quantifying the Impacts of Banning Non Motorized Vehicles from a Major Arterial: Socio-Economic and Safety Evidence

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Abstract

The efficiency of a transportation system is one of the key factors for making an urban system functional and economically competent. This efficiency of a transport system does not only mean increased mobility; it should also focus on easy accessibility by all road users in a low cost and safe way. In developing countries like Bangladesh, Non-Motorized Transport (NMT) modes are significant components of the nation's transportation system and are in large parts of urban cites like Dhaka where accessibility is the foremost demand. Dhaka has been struggling for a long time to improve its transport system with heterogeneous traffic. In this paper, the significance of these non-motorized vehicles (NMVs) in urban areas and the impact of banning NMVs on urban socio-economy and road safety is discussed, with particular reference to a major arterial Mirpur Road. Study shows that banning of non motorized vehicles on a major arterial road tends to impact largely on accessibility and economics with a slight improvement of road safety.

Key words: Non-Motorized Transport (NMT), accessibility, arterial, competent.

1. Introduction

Non-Motorized Transport (NMT) modes are significant components of the nation's transportation system particularly in developing countries like Bangladesh and in large parts of urban cites like Dhaka where accessibility is the foremost demand. Dhaka has been struggling for a long time to improve its transport system with heterogeneous traffic. As part of the initiatives, the Dhaka Transport Coordination Board (DTCB) identified ten major corridors in Dhaka city and decided to free all ten corridors from Non-Motorized Transport (NMT, which includes Cycles Rickshaws, Rickshaws, Vans, Bicycles etc.). Of the ten corridors identified for this purpose, Mirpur Road was chosen as the target area for a Demonstration Project. In addition to other improvement works, this demonstration corridor was prepared NMT free in two phases. At first stage, NMT movement was banned from Amin Bazar to Asad Gate in December 2002, and in the

second phase this banning was extended from Asad Gate to Azimpur, in December 2004. The project was aimed to demonstrate the impact of NMT withdrawal on the road environment through achieving congestion-free traffic movement in arterial corridors and ensuring speed. It was found through different after project studies like HDRC, 2004 and DUTP, 2006 that, this NMT banning did not yield any major improvement to the transportation system here, and in some aspects it caused huge economic burdens to a major portion of road users. This paper has particularly focused on the socio-economic and safety impact after banning of NMT in Mirpur Road as a representative of major arterial roads.

2. NMT as a Global Mode of Transport

In many countries around the world, the use of energy-efficient, cost effective and environmentally sound NMT for urban and rural use has gained significant interest during the last few decades and has become an attractive alternative. According to Pendakur (1993), NMT (walking, bicycles and cycle rickshaws) constitutes 30-60 percent of total person's trips in Asian mega cities. NMT in various mega cities was significant, as follows (Pendakur 1993):

Table 1: Percent of Non-motorized transport (NMT) in different cities.

Cities	Walking Mode	NMV mode
Tokyo	25 %	
Bangkok	16 %	8 %
Jakarta	13 %	12 %
Delhi	14 %	36 %
Lahore	12 %	5 %
Singapore	12 %	4 %
Mexico City	23 %	Unknown
Hong Kong	13 %	Unknown

Another precious study shows that of the total vehicle trips, NMVs account for 25 to 80 percent in many Asian cities, more than anywhere else in the world. NMTs have an important role to play in urban transport systems throughout Asia in the coming decades. The modernization of urban transport does not require total motorization, but rather the appropriate assimilation of walking, NMV modes, and motorized transport. [Jacobs, G.D., Sayer, I., 1983] The level of bicycle ownership in Asia exceeded 40 milion and is still growing rapidly. Japan, Germany, Denmark and the Netherlands have witnessed major growth of bicycle use despite increased motorization, through policies providing extensive bicycle paths, bicycle parking at rail stations, and high cost of motor vehicle use. The majority of the world's 4 million cycle rickshaws and goods tricycles are used in Asia where Dhaka is not an exception. The majority of transport in Dhaka is non-motorized. Approximately 60 percent of all passenger trips within the city are made on foot and a further 20 percent by cycle rickshaws [Bari, M. and Efroymson, D. 2006].

3. Study Area

The Mirpur Road is one of the major arterial roads of the Dhaka city. It stretches westward to Dhaka-Aricha road and acts as a prime transport corridor which links half of the country to the capital.

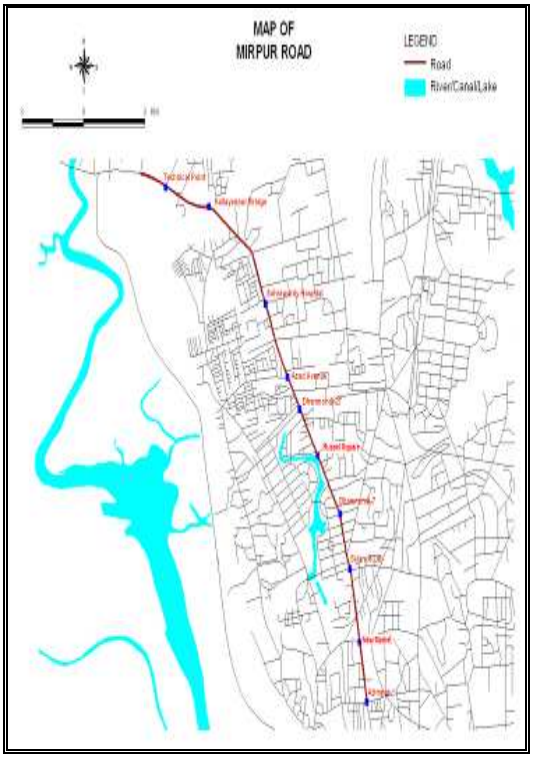

Fig. 1 GIS Map of a major Arterial; Mirpur Road, Dhaka

There is a constant heavy flow of traffic on this corridor throughout the year. It also generates quite a large amount of pedestrian traffic due to the mixed land use pattern alongside this arterial. Besides congestion, travel delays and other operational problems, traffic accidents have become a recurring event on this arterial. A segment from Amin Bazar to Azimpur with varying geometric characteristics having detail accident records during the study period of 1998-2006, was selected for the study purpose. The study area is shown in Figure 1.

For analysis, the road was divided into mainly two major divisions, i.e., Asadgate to Amin Bazar segment, and Azimpur to Asadgate segment.

Road Conditions

Segment: 1 Asadgate to Amin Bazar: number of Lanes from 3 @ 10 feet, per direction, i.e., totals 6 lanes and road width 60 feet. Shoulder width varies from 1 foot to 3 feet and frequency of side road is 6, per kilometer, per direction. Road side abutting properties have rare own parking spaces that is why there exists a huge demand for on street parking.

Segment: 2 Azimpur to Asadgate: number of Lanes vary from 3 to 4 @ 10 feet per direction. Shoulder width varies from 0 to 4 feet. Frequency of side roads is 9, per direction, per kilometer, with road side abutting properties like markets / shopping malls, hospitals, diagnostic centers, schools, colleges, and super shops, with no parking spaces. On street parking is allowed without any charges and regulations.

4. Methodology and Data Collection

The main objective of this research is to show the impact of banning NMV on local economics and evaluate the improvement of accidents scenario with particular emphasis on NMV and thereby to recommend some effective policy options that will be included in the next pilot project for further implementation. For this purpose, accident data were collected for the year 1998 to 2006 from the MAAP5 database of Dhaka Metropolitan Traffic Police, South Zone and Accident Research Institute (ARI), BUET. In analysis, impact on accidents and safety has been investigated using Before-After study on Mirpur Road (Amin Bazar to Azimpur) as a case study, making two divisions because the banning has been performed in two stages as described before. The change in accidents and safety has also been compared by control site analysis, with Rampura to Bishwa Road and Shabagh to Bijoy Shoroni, which are of similar geographic and traffic conditions.

The impacts of banning NMV on local road users and also rickshaw pullers have been investigated by home base and road side questionnaire surveys and some relevant transport and socio-economic data that were collected from different previous

studies conducted on Mirpur Road. Local road users, local housewives, school going students of adjacent school and colleges, some household people with private cars and without private cars and some shop keepers along the road were identified and given questionnaires.

5. Data Analysis and Findings

Findings from analysis of accident data and local road user survey are as follows:

5.1 Accident Classifications

Accident severities are classified according to Ogden, K. W., 1996 SAFER ROADS, A guide to road safety engineering into four major divisions i.e. Fatal, Grievous, Simple and collisions.

5.1.1 Fatal Accident

An accident causing at least one fatality, i.e., one spot death or any death within 30 days at a hospital, is defined as a fatal accident.

Fatal Accident = Fatality + Grievous injury + Simple / Minor injury + Property damage only / Collisions.

5.1.2 Grievous Accident

An accident causing no death at spot or within 30 days, but at least one severe casualty occurred, and the patient needed to be hospitalized, is defined as grievous accident.

Grievous Accident = Grievous injury + Simple / Minor injury + Property damage only / Collisions.

5.1.3 Simple Accident

An accident causing physical injuries of persons with slight medical treatment but no hospitalization is required, is defined as Simple accident or Minor accident.

Simple accident = Simple / Minor injury (required medical treatment but no hospitalization) + Property damage only / Collisions.

5.1.4 Collisions

An accident causing no physical injuries but with property damage, like vehicle damage, road infrastructures broken, which requires traffic flow interruptions, is defined as Collisions or Property damage only (PDO).

5.2 Impact on Safety and Accident

Accident analysis for treated site 1 i.e. Amin Bazar to Asad gate shows that just after banning NMV (December 2002), fatal and grievous accidents increases drastically. This portion is just the transition part of a national highway into a major Arterial where side frictions are less, and here speed has increased with the exclusion of NMV.

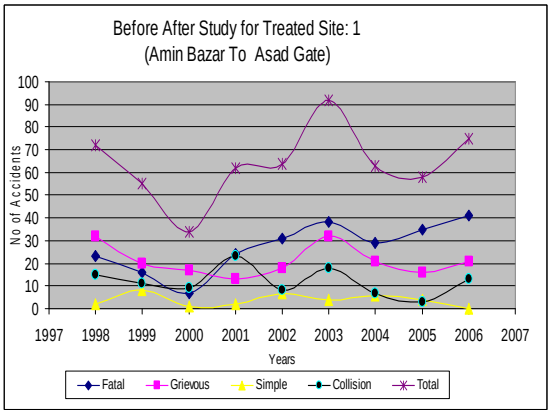

Fig. 2 Accident trend for treated site 1

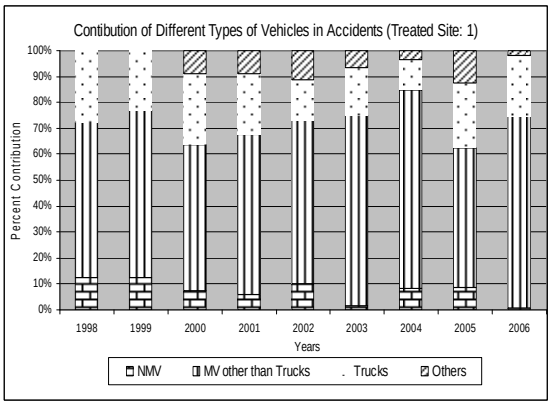

Fig. 3 Vehicle involvements in accidents in treated site 1

In depth study shows that night time truck accidents dominate this percentage. Trucks are permitted to enter this road after 8: 00 pm and cause massacres, not NMVs.

Table 2: Percent change of accidents after banning NMV for treated sites

Accident Severity	**Change of Accident (%)**	
	Treated site 1 (Banned at 2002)	Treated site 2 (Banned at 2004)
Fatal	+77	0
Grievous	+2.5	-60.2
Simple	-12.5	+16.3
Collision	-22.4	-51.7
Total	**+25.4**	**+40.6**

Note: '+' indicates increase.

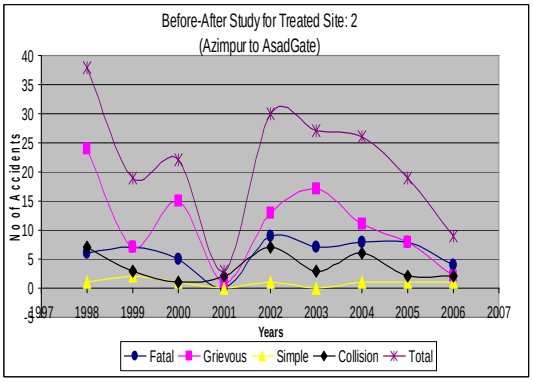

Fig. 4 Accident trend for treated site 2

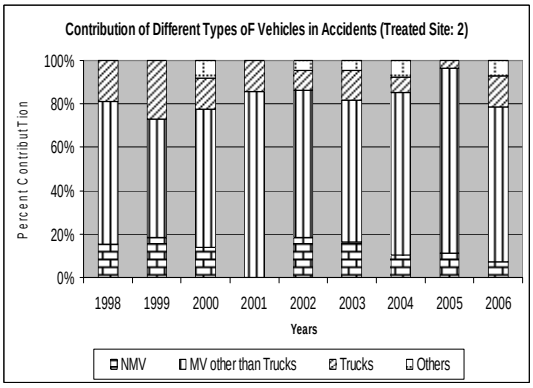

Fig. 5 Vehicle involvements in accidents in treated site 2

Accident analysis for treated site 2, i.e., Asad gate to Azimpur shows that just after banning NMV (December 2004), all accidents decrease in a notable manner. This portion is in the core of a residential area where speed remains low due to side friction and overflow of demand.

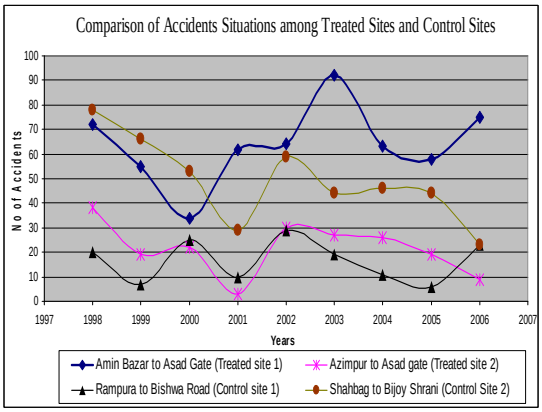

Fig. 6 Control site comparison of Accident trends

Evaluation by control site analysis can not conclude the specific improvement of accident situation for this specific site. Analysis shows that during 2002 to 2004 the safety situation started to improve in three arterials of similar category.

Table 3: Percent change of accidents for control sites

Accident Severity	**Change of Accident (%)**	
	Control site1	Control site2
Fatal	-3.2	-1.4
Grievous	-45	-55.6
Simple	-94.3	-73.1
Collision	-20.2	-17.7
Total	**-31.1**	**-28.5**

Note: Reference year 2004, '+' indicates increase.

Control site 1: Shahbag to Bijoy Sharani is NMV free and Control site 2: Rampura to Bishaw road is not NMV free while treated site 1 remained unusual, which is categorically different and concerned with mobility, as mentioned previously. However maybe the improvement

in these three is due to the establishment of the Accident Research Center (ARC) by the government of republics of Bangladesh in 2002 and of course the awareness of general people. So it can not be concluded that banning NMV is the cause of improving safety or any other factor.

5.3 Impact on Trip Time and Expenses

All participants complained that it takes longer now to go to a destination because they have to use multiple modes of transport. It now takes 2 to 3 times more than the previous period and the travel expenses are also increased almost 1.5 to 2 times previous fare. Moreover, the present situation is not user friendly. Table 4 shows different types of road users who are experiencing different types of troubles in their daily life by using the arterial and their comments, i.e., whether satisfied with this type of banning and the current traffic operation system or not, with background causes in brief.

Table 4: Impact of banning NMV on local road users

User Groups	No of Samples	Evaluation in Percentage (%)			Background Causes of the Major Group in Evaluation for their Comments
		Satisfied	No Change	Unsatisfied	
Car owners	700	11	02	87	Though the speed is supposed increase, unexpected jams are created on the street, by uncontrolled parking on the main arterial, due to lack of police enforcement. That is why average speed has reduced more than before.
MT users	2,500	17	01	82	The service conditions of public transport are not good and available. There is harassment at public buses, while a person asks for a Para transit for a short distance. Drivers do not want to go.
School going children	3,500	03	00	97	It takes longer (two or three times) now to go to school due to the use of multiple modes of transport. Such as, NMV → Road crossing → NMV → Walking → School
College going students (female)	1,200	17	03	84	Encountering difficulties while boarding moving buses and not getting seats, due to the very limited number of seats reserved for women; Bus stuffing behavior towards females is not friendly and polite.
Mothers accompany-ing school children	600	13	01	87	Rickshaws were safe and convenient while buses involve hassle and disturbance and safety problems also.

Table 4: Impact of banning NMV on local road users (Cont.)

User Groups	No of Samples	Evaluation in Percentage (%)			Background Causes of the Major Group in Evaluation for their Comments
		Satisfied	No Change	Unsatisfied	
Female shoppers	520	09	00	91	Could do shopping (Daily needs i.e. fresh vegetables, confectionaries etc) on the way home by rickshaw, but not by bus.
Garment workers (Female)	850	00	02	98	Ladies seats are not available in buses, and buses are not comfortable, and conductors and helpers are not well mannered.
Garment workers (Male)	2,100	09	74	17	They use the public transports often, so a maximum of them have the same travel time, because of the same public transport, and the same route.
Middle income male employees	450	23	18	59	Not enough transport to replace the withdrawn rickshaws. Have to wait in long queues and are hung like bats while traveling in local buses.

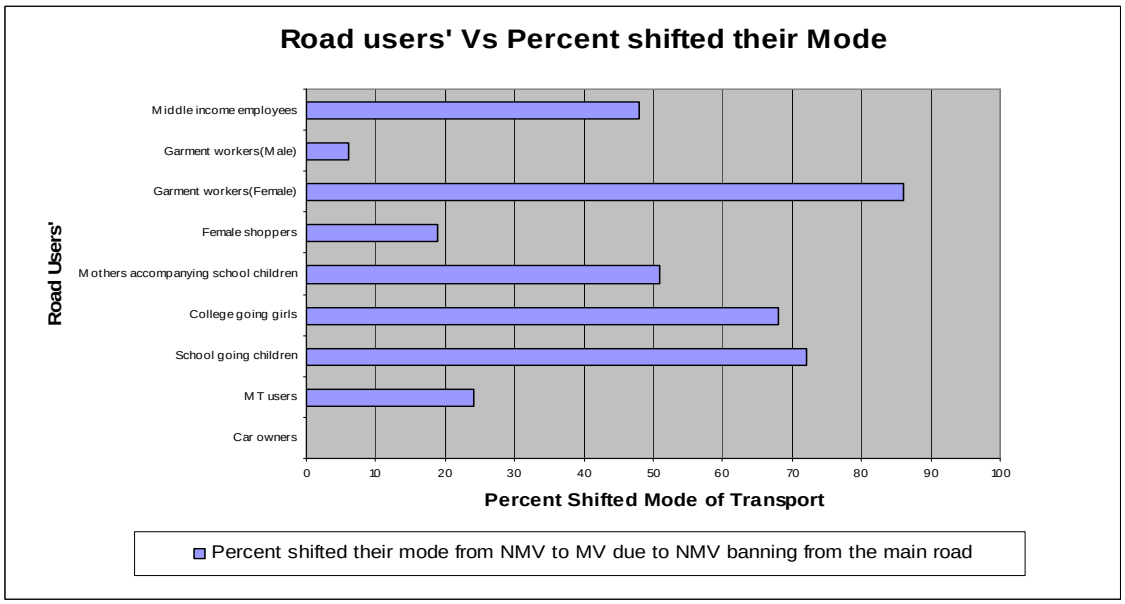

Fig. 7 Percentage of different road users that shifted their mode of transport after banning NMV

5.4 Why did commuters shift their mode?

The adjacent commuters and road users are not satisfied with the banning as Figure 4 shows, yet Figure 7 shows that different types of road users have shifted their mode of transport from NMV to MV. The in-depth study identifies the following reasons: a. Increase of trip time with non standard ways used by the NMVs, b. NMVs' fare have increased, c. Heavy competition in getting a rickshaw with limited suppy of rickshaws for huge numbers of passengers, d. Allocated road conditions are very poor, e. Lack of personal security, especially at night time, with load shedding conditions.

5.5 Survey of Rickshaw Pullers

5.5.1 Impact on Income: Almost all the rickshaw pullers commented that their income has been lowered, because: they have to use an alternate way, the length has increased too much, it takes more time, and on those alternate roads there is a continuous jam so often they are not interested to go through that jam. Another point is that passengers do not want to give as much payment as they want, and they also do not want to go at the lower payment as the passengers want, to pay. As trip time has increased the number of trips has decreased.

5.5.2 Impact on Trip Time: All the rickshaw pullers said that it takes much more time than before. It was also the comments of passengers. Rickshaw pullers have to use an alternate road of extra length, a narrow side road on the main road, and there, capacity is always below the demand. So a forced flow condition prevails there. The time required for those trips has increased to more than three to four times than before.

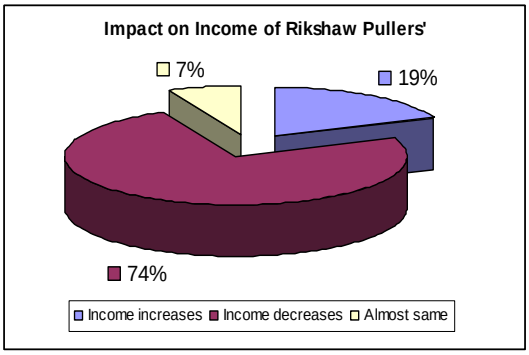

Fig. 8 Impact on income

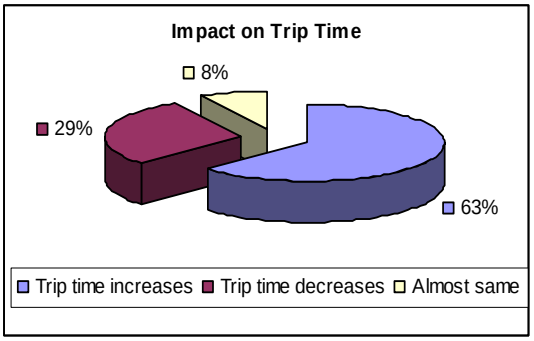

Fig. 9 Impact on Trip time

5.5.3 Impact on Labor: As discussed earlier, the long length and time of trip have made the driving very labored. It becomes tougher when they carry freight.

5.5.4 Impact on Safety and Accidents: After separating MV and NMV, the rickshaw accidents have decreased. But side swipe accidents from rickshaw-to-rickshaw have increased, causing frequent damage to spokes of the wheels.

6. Conclusion and Recommendation

Although NMT plays a very important role in urban transportation of Bangladesh, appropriate importance is not given to it. All the Government policies have a bias for MV, while management policy should see the wider context of community and need for urban travel and accessibility.

Mirpur road was declared NMV free without feasibility analysis, Modal split and demand analysis, and also without

providing any complimentary number of public transports. So, Bus services and their standards should be increased by vehicle development, integrated services, improved management systems, use of information technology, new fare structures and forms of tickets, and improved information for users.

The banned NMVs use narrow passages which are not authorized by the municipality. So separate NMV lanes and separate signal time for NMVs should be provided where needed.

An elaborate study and survey is needed on local community and road users to know about their demands. Then, that experience can be merged with proper engineering knowledge and judgment before planning and implementing any improvement in the transportation system. This was not done before banning NMV in the concerned arterial, Mirpur road in Dhaka City, which led to the existing problem.

7. Acknowledgements

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