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[기본연구] 방글라데시 다카의 버스 전용 차로의 기회: 지속 가능한 도시 교통을 위한 새로운 방향

국제도시 및 인프라연구센터
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Opportunities of Bus only lanes in Dhaka

: A Way Forward for Sustainable Urban Transport

Md Tusher

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ABSTRACT

Dhaka, the capital of Bangladesh, with a population of nearly 18 million, is one of the most densely populated cities in the world. The city's public transportation system comprises Metrorail, NMTs, taxis, and buses. Unfortunately, the city's travel demand cannot be met by the current public transportation systems, particularly the bus transit operations. As a result, a variety of motorized and non-motorized paratransit systems (such as auto-rickshaws, tempos, minivans, rickshaws, etc.) are available to meet the demand. And those who have the ability to move to a private car. Nowadays, in Dhaka, more than 50% of the road is occupied by cars, resulting in the city becoming car-centric.
In view of the worsening traffic congestion and deterioration in accessibility, level of service, comfort, safety, and operational efficiency, it is time to introduce exclusive bus lanes in the city for a dramatic change in the transportation system. For the pilot corridor case study, data have been collected using a questionnaire survey in five different locations in the case study corridor. Based on these data, various operational parameters have been observed. After analysis, we can say that if we develop an exclusive bus lane and operate buses in a coordinated manner, the efficiency of the public transportation system will increase drastically and congestion will decrease significantly in the study corridor.

방글라데시의 수도 다카는 약 1,800만 명의 인구를 보유한 세계에서 가장 인구 밀도가 높은 도시 중 하나이다. 이 도시의 공공 교통 시스템은 메트로레일, NMT, 택시, 버스 등으로 구성되어 있다. 불행히도 현재의 공공 교통 시스템, 특히 버스 교통 운영은 도시의 교통 수요를 충족시키지 못하고 있다. 이에 따라 오토릭샤, 템포, 미니밴, 릭샤 등 다양한 모터화 및 비모터화 보조 교통 시스템이 수요를 충족시키기 위해 운영되고 있다. 또한 개인 차량을 소유할 수 있는 사람들은 개인 차량을 이용한다. 현재 다카에서는 도로의 50% 이상이 차량으로 차지되어 도시가 차량 중심의 구조로 변모했다.
교통 정체 악화와 접근성, 서비스 수준, 편의성, 안전성, 운영 효율성의 저하를 고려할 때, 도시의 교통 시스템에 극적인 변화를 가져오기 위해 전용 버스 차선을 도입할 때가 되었다. 시범 구간 사례 연구를 위해 사례 연구 구간 내 5개 다른 위치에서 설문조사로 데이터를 수집했다. 이 데이터 기반으로 다양한 운영 파라미터가 관찰되었다. 분석 결과, 전용 버스 차선을 개발하고 버스를 협조적으로 운영한다면 연구 구간에서 공공 교통 시스템의 효율성이 급격히 향상되고 교통 체증이 크게 감소할 것이라고 결론지을 수 있다.

I Introduction

Dhaka city, the capital city of Bangladesh is suffering from serious congestion from dawn to dusk and even after that. At present approximately 18 million people are living in DMA area and as per United Nations World Urbanization Prospects 2018 Revision, in 2030 the population of Dhaka will stand at 28.0 million. According to multiple studies, there are over 21 million journeys made within the city each day, and 94% of these requests are reliant on public transportation in one way or another (JICA, 2010). Nevertheless, the current public transportation system has not been able to meet passengers' expectations for full service because of persistent congestion across the entire city and ineffective operation policies. Consequently, a range of motorized and non-motorized paratransit systems (such as minivans, auto-rickshaws, tempos, rickshaws, etc.) are available to meet the demand.

The current public transportation system, and bus transit operations in particular, is characterized by falling well short of the people's ideal requirements for reliability, comfort, speed, and safety. Buses are typically seen as unreliable and time-consuming to get to their destination in Dhaka. Therefore, in order to make buses more dependable and efficient, a system for allocating them priority and special road space must be developed. Policymakers and experts in public transportation view exclusive bus lane as a practical means of enhancing bus transportation services. The exclusive bus lane concept is being adopted by many cities nowadays as a means of finding affordable transportation options, and it has shown great promise as a low-cost transit option for developing nations. In this lane, only authorized buses will be operated as in the BRT system, so the bus will stop only at the stoppage.

The purpose of this paper is to explain how exclusive bus lanes increase public transport efficiency and reduce congestion in Mirpur-1 to Azimpur, Dhaka corridor. This corridor is very congested and economically vibrant road in the city. This research is only limited to one corridor of the city, which is from Mirpur-1 to Azimpur, and three types of transport modes will be considered: bus, car, and motorcycle, respectively. Also, in this research, we will use some secondary data that has been collected by different transport agencies since 2005.

II Literature Review

Exclusive bus lane has been defined as a corridor in which particular buses operate on a dedicated right-of-way such a bus lane reserved for buses on a major arterial road. Although this definition describes many existing BRT systems. Exclusive bus lane is the integral part of BRT system. In revised strategic transport plan (2015-2035) for Dhaka, five Metrorail lines and two BRT lines has been proposed. By these lines one third of my proposed corridor will be covered. But my selected corridor is one of the most congested and vibrant roads nowadays.It is urged that Bus Rapid Transit (BRT) has been seen as a "creative, emerging public transit solution" which can be cost-effective in addressing urban congestion (Currie, 2006).

Fatima & Kumar explained about public bus transit in Indian cities in 2014. They argued that approximately 45% to 51% of possible modes will shift from private modes to the proposed public transit system. Barua et al. conducted a similar analysis on the opportunities and operational difficulties of introducing bus rapid transit (BRT) in Dhaka. They discussed the determination, key issues, and operational difficulties of implementing BRT-3 in Dhaka. Hoque et al. also conducted an analysis in 2013 about the need for BRT in Dhaka. They find the relevance and potential to enhance and improve the quality of public transport services in metro Dhaka by introducing BRT. So, it is observed that all the above-mentioned research is conducted to find the benefits of the BRT system. But my objectives of the research are about the exclusive bus lane, which deals with the increasing efficiencies of public transport and the reduction of congestion by the modal shift from private vehicles to public transport.

III Methodology

Data was collected manually using a questionnaire survey. The majority of the data was collected from direct field surveys conducted by the researcher. Since limited information have been accessible from secondary sources like different transport authorities of Bangladesh, published and unpublished work about different features of the studied area. Along the survey route, the survey conducted at five different bus stoppages. Photographs have been taken at several locations to illustrate the many disparities in mass transportation movement without hindering the free flow of vehicles and pedestrians. In addition, passenger opinions regarding the length of the trip and the risks currently present along the chosen line were gathered through field surveys.

Ⅳ Data Collection and Analysis

4.1 Study area

The whole study is conducted in five different locations along this corridor. The researcher chose the busiest bus stoppages in this corridor: Mirpur-1, Shymoly, Asad Gate, Lake Circus, and Azimpur, respectively. Some photographs have been taken for further research on road condition, pedestrian facilities, road condition, and bus condition. In this study, only three types of transport have been considered: bus, car, and motorcycle, respectively.

4.2 Study Period

Along the case study corridor total travel time at peak time (7:30-10:00AM) of the day has been observed. Total 48 nos. questionnaire survey have been conducted in different five location of the corridor.

4.3 Road Geometry

The study corridor is 9 km long from Mirpur-1 to Azimpur, and this road is six lanes, which means three lanes per direction. The road width is 26m on average, but in some parts, it is nearly 30m. Almost 30 thousand people are moving through this road per hour during peak hours. The fare is very cheap, which is near 0.217$ for passing 9km of the road by bus. There are twenty bus stoppages and nine intersections exist in the study corridor.

4.4 Modal share

A bus's primary benefit is its capacity to transport lots of people in a short amount of time. Also, if the number of cars on the roadway is high, it creates traffic congestion. In Table 1, in one hour the number of passengers carried by the bus is about 30 times higher than that by car. Also, it has been observed during the survey that the number of cars passing through the road is more than double that of buses. So, the traffic jam will drastically reduce if the number of cars can be reduced from the road.

Table 1. Modal share at study corridor

Vehicle Type	Approximated passenger boarded at peak hours (7:30-10:00am)	Number of vehicles observed	Number of passengers carried during the survey
Bus	60	26	1526
Car	3	11	33
Motor Cycle	1	11	11
Total			1604

(Source: Field survey)

4.5 Purposes of Use Car/Taxi

One of the disadvantages of using public bus is you have to come the bus stop for your travel. That means public bus is not a door-to-door service. But the cars have the ability to give door-to-door service. So, due to public transport inefficiency peoples are moving to use cars of taxis. As in Dhaka there is no school bus service, people mostly use cars to drop their children's school. Also, for any patient it is difficult to ride bus in peak hours in the morning time to go hospitals. So, they are bound to use private vehicle of taxi. From figure 2 we can see clearly that 46% people are using cars for their work purposes, 36% of people are using for their children's school purposes, and 18% are using for medical purposes during the survey period. So, if we manage good and reliable public transport then a significant amount of car user may shift their mode of transport.

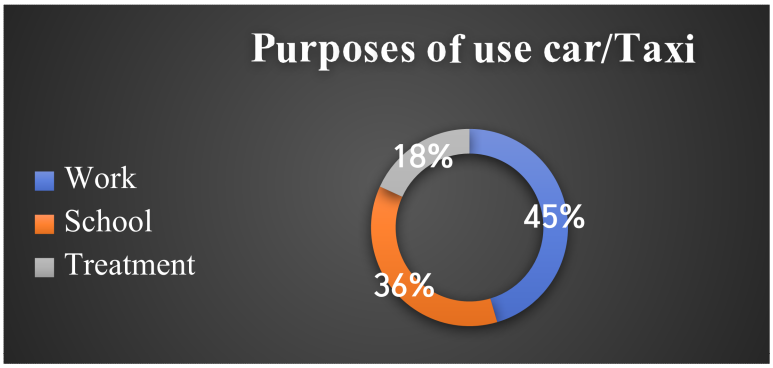

Figure 1.Comparison of purposes of using car/taxi(Source: Field survey)

4.6 Average Travel Speed

The two peak times are in the morning, when all offices and educational institutions start, and in the afternoon, when all offices and some educational institutions close their work. After gathering this data, a mean travel speed has been observed for the morning peak. From figure 2, it is observed that the mean travel speed towards Azimpur is 5.83 km/h, but the travel speed towards Mirpur-1 at the morning peak is 14.14 km/h, which is almost three times larger. The inherent causes behind this are that Azimpur is mostly surrounded by universities, colleges, and shopping centers, and most of the middle-income people are living in Mirpur. That's why in the morning people go to Azimpur, and in the evening they come back. Also, the mean travel time is significantly different in two directions of the study corridor.

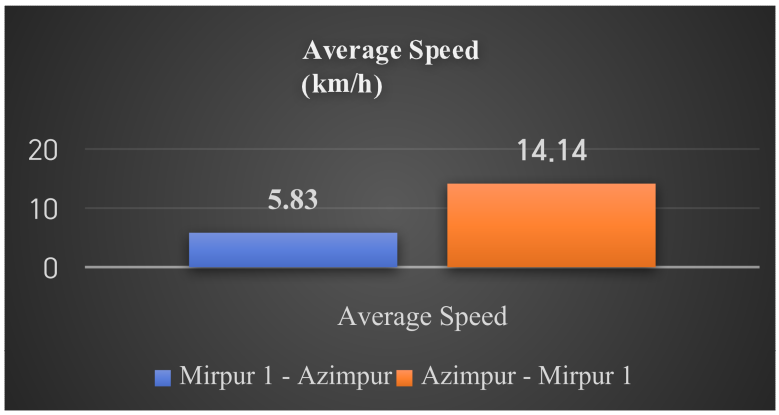

Figure 2.Comparison of average travel speed at morning peak between two directions of road (Source: Field survey)

4.7 Willingness to Shift from Car to Bus

According to the questionnaire survey, it has been found that if the level of service is increased in public transport service and if the travel time decreases significantly, then, as shown in Figure 3, 64% of people want to shift their mode of transport. Because they told me that using a car is very costly and time-consuming, there is limited safety for women and children. Even sometimes, they cannot ride the bus during peak hours.

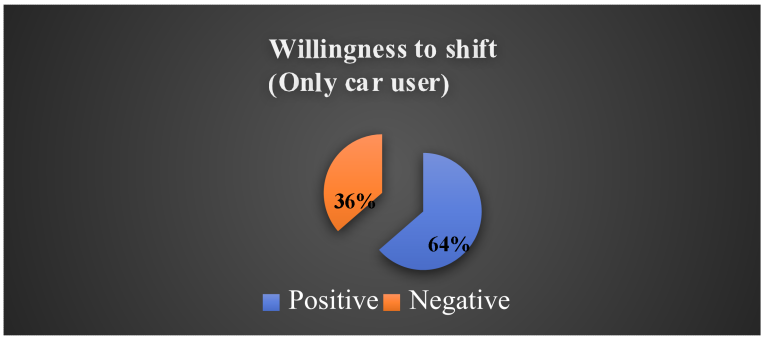

Figure 3.Comparison of willingness to shift from car to exclusive bus only transportation system(Source: Field survey)

4.8 Condition in bus industry

There were 6488 permitted buses in Dhaka City as of March 2008, according to the BRTA[1], and many of these buses are run by private proprietors. Most of the time, crews and drivers hire the buses on a daily or monthly basis. After that, they are responsible for managing the buses' revenue risk. They need to carry enough passengers each day to pay back the bus rental costs, cover the cost of fuel and basic maintenance, and turn a profit. As a result, Dhaka's current bus sector has not grown in a healthy way. The bus business is in terrible shape, which leads to a lack of coordinated control over these vehicles and a lack of commitment to a route. This causes time waste, hostile road competition, and resource waste. The consequences of bus ownership fragmentation include rudeness from bus personnel, reckless driving, people getting on and off the bus in the middle of the road, and the nosing of buses.

(BRTA- Bangladesh Road Transport Authority is the registration authority of vehicle in Bangladesh)

4.9 Mixed flow operation

There is a complex mixture of motorized and non-motorized traffic in the same lane along the study corridor. The road is occupied by inefficient modes of transport like private cars, rickshaws, etc. According to the BRTA, the majority of private cars had been registered in Dhaka up to 2007 and the unofficial number of rickshaws is above 10 lacs in this city. As slow and fast-moving vehicles are plying in the same lane, the speed of fast-moving mass transit buses is decreasing significantly.

V Conclusion and Recommendation

Travel speed is lower towards the Mirpur-1 to Azimpur end and higher towards the Azimpur to Mirpur-1 end. The main reason behind this is that almost all schools, colleges, universities, and offices start at 9:00 a.m. But as Mirpur is mostly a residential area, unless some garment factories are situated here, that's why all students and workers go towards Azimpur, and at that time the roads have lost their capacity. As the public transportation system is not well developed, a lot of cars run during that time. Using a car in this city is very expensive, and because of the lack of good transportation, these people are moving by private vehicle. Increasing the number of NMT is also the result of inefficient transportation. If we can provide a good transportation system, people will use bus service. That's why our proposal to make an exclusive bus lane will revolutionize transportation in this corridor. BRT can also be introduced in this lane; if we can do this, then efficiency, reliability, accessibility, and passenger carrying capacity will increase. On the other hand, congestion will decrease significantly in the mixed-traffic zone. Because, as per the study, more than 50% of car users will shift their transport modes. For getting ultimate efficiency from an exclusive bus lane, the following recommendations can be considered:

In Dhaka, for a single route, 6 to 7 companies have been given route permits. For the ultimate benefits of the bus-only lane, BRT service can be introduced, or all the bus companies must operate their buses in this corridor by creating a cooperative society. In this way, unhealthy competition among buses will come to an end.

The drivers and helpers are paid on a daily basis. As a result, they always try to make more profit through unhealthy competition by collecting more passengers. If the government makes a policy that they will pay by running the length of the bus, not collecting money, Then the bus service will be more popular. In this process, government subsidies are needed for operating buses. Also, a transport card can be introduced for cashless transportation in buses. It makes the travel more comfortable.

Without a bus stoppage, no bus will stop anywhere. There should be a real-time bus information system for passengers. It will make the transportation system more reliable.

After developing an exclusive bus lane-based transportation system, all NMTs should be removed from the corridor. It will reduce the congestion significantly in the corridor.

Bus frequency is another crucial component. The frequency needs to be higher during peak times. However, bus service should be accessible after midnight; however, it might not run as frequently. These characteristics make up the perfect public transportation system.

To improve accessibility for public transportation that relies on buses, toll-free bicycles ought to be implemented. Additionally, a nice, safe path connecting the bus stops should be built.

A dedicated lane for buses is a common scenario in developed countries. If we successfully implement this project, the whole scenario of the transportation system in this corridor will be improved. People will enjoy affordable, cheap, and reliable urban public transport.

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