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Rahman, Mamun Muntasir and D'Este, Glen and Bunker, Jonathan M. (2008)  
*Problems and prospects of non-motorized public transport integration in developing cities*. In: The 30th Conference of the Australian Institutes of Transport Research, 10-12 December 2008, Perth, Western Australia.

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## **PROBLEMS AND PROSPECTS OF NON-MOTORIZED PUBLIC TRANSPORT INTEGRATION IN DEVELOPING CITIES**

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### **ABSTRACT**

The benefits and costs of the paid category of non-motorized public transport (NMPT) – especially three wheeler cycle rickshaws – have long been a major transport planning problem in many developing cities. Policy measures to restrict or eliminate non-motorized vehicles, especially NMPTs, from urban arterials and other feeder networks have already been implemented in developing cities as diverse as Delhi, Bangkok, Jakarta, Manila, Surabaya, Beijing and Bogotá. Over the last few years, the government of Bangladesh has implemented policies to phase out non-motorized transport, particularly rickshaws, from the major traffic spines of Dhaka City. The acceptability, rationality and implication of such ‘solutions’ are widely argued in Bangladesh, as well as internationally. The argument is severe in Dhaka, the case study of this research, considering social acceptability, economic response, fuel free eco-friendly characteristics and magnitude of role of rickshaw in sustaining the traffic and mobility needs of citizens. Therefore, rather than simply pursuing policies to eliminate NMPT, a better approach may be to integrate motorized and non-motorized vehicles as complementary rather than competitive forces in meeting the comprehensive demand of Dhaka's transport. With the backdrop and given the international significance of the problem, this paper will delineate a preliminary framework for the future place of the NMPT-rickshaw and explore the problems as well as opportunities for its sustainable co-existence in a mixed mode transport stream that best meets the network performance needs of Dhaka.

**Keywords:** Non-Motorized Vehicle, Non-Motorized Public Transport, Rickshaw, Integration, Sustainable, Developing City.

## 1. INTRODUCTION

Over the last few decades, large cities in Bangladesh have been experiencing spontaneous and imbalanced transport sector development resulting in severe congestion and poor levels of service, especially on urban arterials that act as the network spines of the city. The urban transport issues of mobility, congestion, safety and environmental aspects are becoming increasingly important and critical in Bangladesh (Hoque, Khondokar & Alam 2005). The modes commonly considered at a policy level to address the situation include public motorized transport (MT) modes especially the mass transit systems – prototype buses, trains and sophisticated new generations of Bus Rapid Transit (BRT), as well as rail based Mass Rapid Transit (MRT). The planned provision and incorporation of non-motorized transport (NMT) modes (walk, bicycle and cycle-rickshaw) in the motorized traffic stream are often neglected. In particular, the paid category of non-motorized public transport (NMPT) - three wheeler cycle rickshaws - are often seen as inefficient and backward, especially as being 'slow moving', 'congestion creators' and 'inhuman' despite this mode's significance in the transport system of Bangladesh and its capital city, Dhaka.

In continuation of this ideology towards NMT, particularly NMPT, the Government of Bangladesh (GoB) has recently implemented policies to remove non-motorized vehicles (NMV) from the major traffic spines of Dhaka City in line with the global trend to restrict or eliminate NMVs from urban arterials and other feeder networks. These policies have already been implemented in cities as diverse as Delhi, Bangkok, Jakarta, Manila, Surabaya, Beijing and Bogotá.

The acceptability, rationality and implication of such 'solutions' are widely argued in Bangladesh, as well as internationally, bearing in mind the magnitude of the role played by rickshaws in sustaining the traffic needs of citizens. Rickshaws continue to be crucial for the transport system of Dhaka, particularly when considering short trips as primary trip types in Dhaka; a modal preference for rickshaws by significant social groups (women and office goers) improved sense of security, comfort and reliability; reduced road occupancy compared to private automobiles (Human Development Research Centre study, cited in Bari & Efrogmson 2007); huge workforce involvement; and a growing role as a freight carrier. . The major criticism of the rickshaw as a slow-speed congestion-generating vehicle is positively traded off when we consider increased walking time, waiting time and transfer penalties involved with motorized vehicles for short trip journeys (Bari & Efrogmson 2004). The key role placed by NMPT in Dhaka is therefore hard to deny. Though the constant inflow of sophisticated private and public motorized transport will take place in the future transport system of Dhaka, a gap for demand responsive transport mode suitable for short distance trips will always exist.

Therefore, instead of simply pursuing policies to eliminate NMPT, a better approach would be to integrate these two vehicular categories: motorized and non-motorized as complementary rather than competitive forces in meeting the comprehensive demands of Dhaka's transport. With this backdrop, this paper, as a part of ongoing research, defines and investigates the present scenario of the NMPT-rickshaw in the transport system of Dhaka and explores future opportunities for its sustainable co-existence in a mixed mode transport stream that best meets network performance needs of the developing capital city of Bangladesh.

## 2. EVOLUTION AND GROWTH OF NMPT- DHAKA PERSPECTIVE

The original version of the NMPT was 'hand pulled rickshaws', which were first introduced in Japan in 1870. The concept then spread to countries including China, India, Singapore, the French-Indo-China colonies, South Africa and for a brief time in America and Australia. Gallagher (1992) argued that they were however, never common in Dhaka though some were used in Chittagong and Rangpur.

The NMPT form presently operating in Bangladesh is cycle-rickshaws which were introduced first in Europe and Asia. These cycle-rickshaws were developed from the penny-farthing bicycle concept, some of which were made into tricycles and there were attempts to introduce them as rickshaws in both England and Asia around 1886. The rickshaw was used at a large scale by other countries in Asia including Bangladesh. Gallagher (1992) stated that Singapore was the first city to use cycle-rickshaws on a large scale. Calcutta's first cycle-rickshaws appeared around 1930 (Unnayan & Thomas, cited in Warren 2003) and they soon spread to other towns in the hinterland. They reached what is now Bangladesh in the mid-1930's, and Dhaka by 1938 [Rashid, cited in Begum & Sen 2005]. The cycle rickshaws of Dhaka had their present look by around the 1950's.

These cycle-rickshaws are a type of the traditional rickshaw, literally meaning 'man-powered vehicles'. According to Gallagher (1992), the name was originally given to the hand-pulled rickshaws which thronged Asian cities in the 1920's and 1930's, but now it applies to the cycle-rickshaws of India and Bangladesh as well. These vehicles are also known as trishaws, pedicabs, samlors, xiclos, or becaks (Replogle 1992). The NMPT dealt with in this research paper include cycle-rickshaw having one front wheel and two rear wheels, an average speed of 5 to 12 km/hr over distances of up to 40 km (Replogle 1992) and capable of carrying two passengers in addition to the driver, or freight loads of up to 250 kg without a passenger (Replogle 1992) (Photo 1).



Photo 1.1: Rickshaw as Passenger Carriage



Photo 1.2: Rickshaw as Freight Carriage

### Photo 1: Rickshaw Usage in the Streets of Dhaka (Fotosearch 2008)

The rickshaw population of Dhaka in 1972-73 was 14,667 which doubled to 28,703 in 1982-83, but thereafter increased rapidly to reach the figure of 88,159 at the end of 1986-87 (Database of Bangladesh Bureau of Statistics, cited in Gallagher 1992). Gallagher (1992) forecasted rickshaw numbers in Dhaka to reach the figure of around 300,000 in 2000. According to the Institute for Transportation and Development Policy (ITDP) (2005) and the Strategic Transport Plan for Dhaka (STP) (2005), the total cycle rickshaw population has continued to grow and is now estimated at around 500,000.

### **3. NMPT AND RICKSHAW- POLICY CHANGES OVER TIME**

Many developing cities, particularly those in Asia, in previous years have imposed constraints on NMTs including cycle-rickshaws and bicycles claiming that they "cause congestion." The restrictions have often led to further negative impact on the transport system.

#### **3.1 Global Context**

##### **3.1.1 Developed Cities**

Private NMT like the bicycle has traditionally been incorporated as an integral part of overall transportation system planning in the developed world, such as Delft in the Netherlands and Tokyo in Japan. This is, however, mostly used as mode of recreation and physical exercise.

##### **3.1.2 Developing Cities**

The scenario is markedly different in developing cities like Dhaka, Calcutta, Jakarta and Surabaya where the dominant NMV mode has been the NMPT, cycle-rickshaw. The degree of social, economic and travel dependency on this mode is substantially greater compared to private NMVs. Despite the significant advantages that NMVs have, it is increasingly under threat in the developing world and in some cities concerted efforts have been made to eradicate it. The efforts have usually been two-fold, either removal from roads, or restriction on their registration and licensing, or a combination of both.

##### **3.1.3 Some Policy Change Initiatives and End Results**

Manila banned NMV initially in 1950's but some of them re-emerged in 1990's. Bangkok banned them in 1960 and Karachi in 1962. Jakarta followed the trend in 1988, then lifted the ban briefly in 1998 before reversal. New Delhi followed suit during the early 1980's and also put restriction on the number of cycle-rickshaw registrations as well as licensing.

Transport statistics suggest none of these cities that imposed NMV bans were able to solve their transport problems by doing so. In most cases the situation became even worse. From the modal shares of different vehicles, it becomes clearly evident that NMVs were replaced by higher pollution generating vehicles like motorcycles and motorized three wheelers. The modal share of motorcycles or motorized three-wheeler in these cities accounts for 35 to 70% of the total vehicles (World Resource Institute 1996 & Vehicle Statistics of Indonesia database, cited in Bari & Efroymsen 2007), which is more or less similar to that of rickshaws in Dhaka. The average travel speeds in most NMV free cities are also generally lower than that of Dhaka. Bangkok and Jakarta are notorious for traffic congestion and pollution (GTZ 2003). Some governments' policy decision to ban NMVs may also be driven by the desire to boost domestic car manufacture, even though the employment gained from this will not always offset the employment lost from any decline in non-motorized transport, and despite the pollution increase and foreign expenditure required for oil importation (Whitelegg & Williams 2005).

The above discussion clearly depicts that, where total or partial NMV bans have been made over the years in different cities of Asia, the experiences have not been very pleasant. Most of these initiatives have lead to failure and subsequent decision reversal, and where such bans persist, the sense of dissatisfaction prevails. For example, even long after the ban, about 70% of residents in the low income neighbourhoods of New Delhi and Jakarta favour reintroduction of NMT (GTZ 2003).

### 3.2 In Bangladesh

In Bangladesh, NMVs including NMPTs are traditionally being discouraged compared to motorized transport. The comparative policy standing of government towards various modes operating in Dhaka is presented in Table 1. Dhaka has always been the main receiver of such NMV hostile policies.

**Table 1: Government Policy Towards Transport Services at Operation in Dhaka City**

Travel Mode	Type		Government Policy		
	Motorized	Non-motorized	Supportive <sup>^</sup>	Restrictive *	Negative**
<b>Passenger</b>					
Metro Train	●		●		
Bus	●		●		
Micro-bus	●		●		
CNG Auto rickshaw	●			●	
NMPT (Rickshaw)		●			●
Taxi	●	●		●	
Car/Jeep	●		●		
Motorbike	●		●		
Bicycle		●			●
<b>Freight</b>					
Truck	●		●		
Rickshaw van		●			●
Pushcart		●			●

Source: Derived from STP (2005) and Critical Analysis

<sup>^</sup> Infrastructure design, finance and regulatory support;

\* Restricted in terms of total fleet number

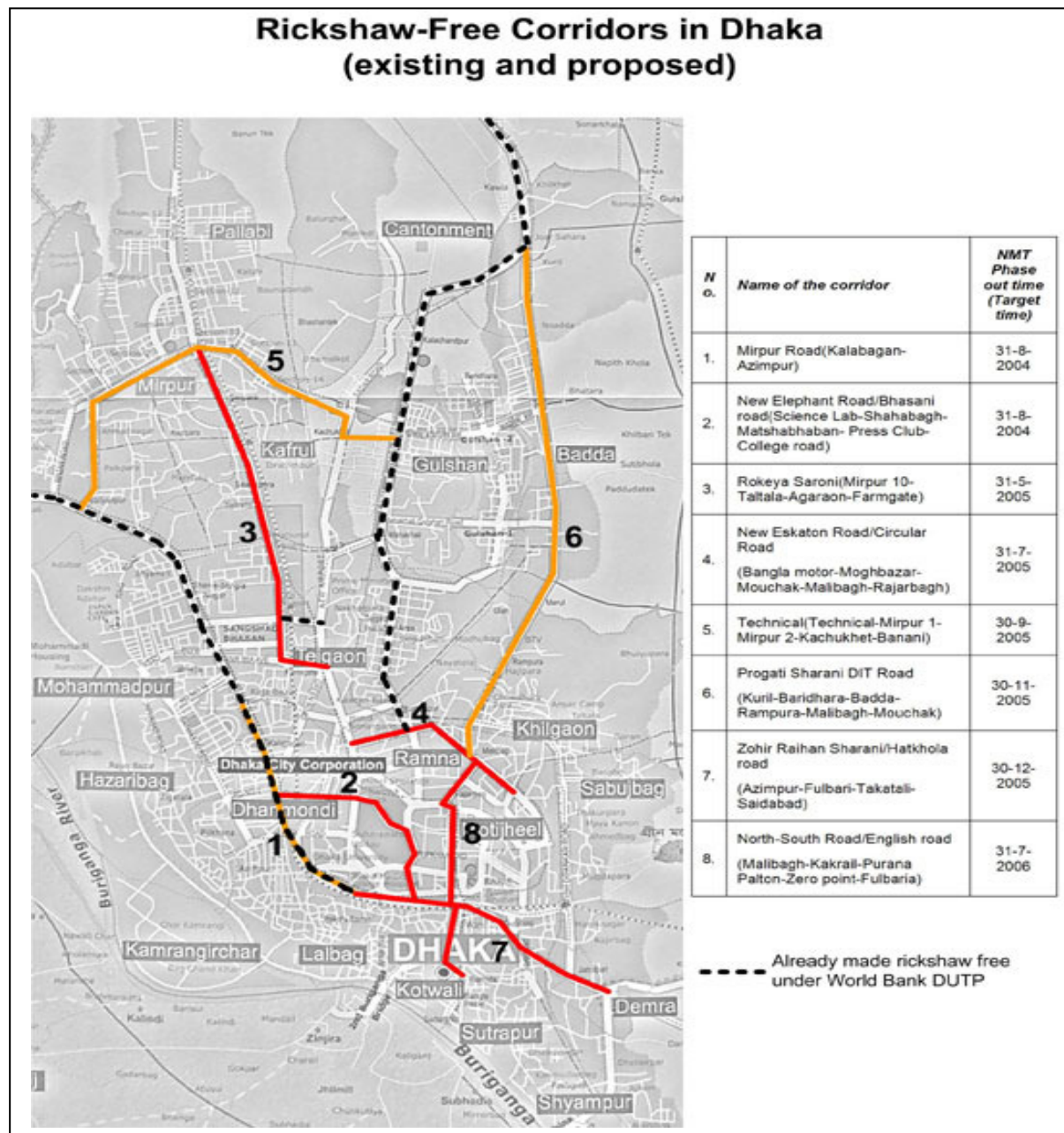
\*\* Non-cooperation regarding infrastructure design, finance and regulatory support.

#### 3.2.1 Rickshaw Restriction Initiatives in Dhaka: Previous Experience

In April 1987, the government of Dhaka announced plans to completely ban pedicabs from the city on safety grounds, although at the time, they employed more than 100,000 people (Washington Post report, cited in Replogle 1991b). Later this did not materialize due to political reasons and public movement. This has been followed by restricted registration as well as licensing for NMPT in 1989 and high taxation on spare parts. The former is still in practice. Replogle (1991a) and Gallagher (1992) emphasized the NMV unfriendly situation stating that stiff protectionist policies aimed at aiding domestic NMV producers impose a high cost on cyclists and cycle-rickshaw users while often failing to create viable industries. When combined with low taxes on motor vehicle imports, such policies foster economically inefficient choices.

Despite emphasising the importance of accessible NMVs for people living in developing countries and the benefits of non-motorised transport in the face of climate change, the World Bank in 2001 suggested banning or movement segregation of motorised and NMT on major corridors for traffic flow improvement (Hummel 2008). In line with these guidelines plus the recommendations of the Dhaka Urban Transport (DUTP) (1998) and the National Land

Transport Policy (2004) adopted by the Government of Bangladesh (GoB), Dhaka City Corporation (the city government) planned for phasing out of cycle-rickshaws from eight major roads of Dhaka (Figure 1), comprising a total of 120 km. This is in order to make way for motorized transport and creating separate routes for NMVs including NMPT rickshaws (Manchetti 2005).



**Figure 1: Rickshaw Free Corridor in Dhaka (Existing and Proposed)**

Source: Efroymsen & Bari 2007

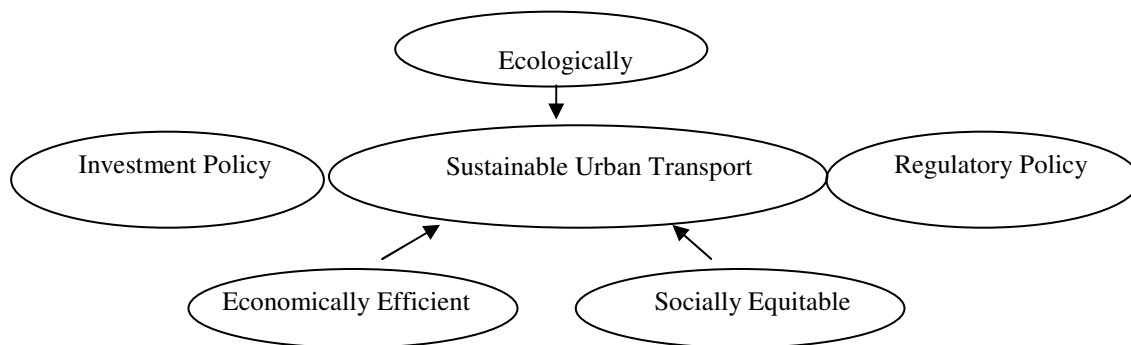
However, observing the severe socio-economic implication of such policy measures on the population and the marginal improvement in traffic conditions, the World Bank in early 2005 reversed its patronage for rickshaw restriction from major roads in Dhaka. This policy reversal is also evident in the DUTP project performance assessment report (2007), which admitted the ineffectiveness of such rickshaw restriction measures stating that the banning of

rickshaws from certain intersections and corridors had a negative impact on rickshaw drivers and some users.

The policy initiatives discussed so far clearly demonstrates their unsuccessful and ineffective end results. Such efforts have failed to be successful because they focused on private motorized vehicles and not on broader mobility needs.

#### 4. NMPT CONTRIBUTION AND INTEGRATION IN DHAKA

Bicycles, cycle-rickshaws, rickshaw-vans and push-carts are common forms of NMTs observed in the traffic composition of Dhaka, in addition to the most basic mode, walking. Wiperman & Sowula (2007) highlighted that buses, auto-rickshaws and taxis are the most common motorized transport forms. Rickshaws on other hand are the most common non-motorized form and one of the key primary modes in the traffic environment of Dhaka. Factors contributing to rickshaw popularity include its socio-economic contribution and access equity; workforce dependence; appropriateness to the prevailing physical network structure; travel suitability for specific trip types; and fuel free nature yielding environmental sustainability. Most of these also correspond to the notion of transport sustainability (Figure 2).



**Figure 2: Sustainable Urban Transport Policy Spectrum (Kalthier 2002)**

The role of NMT in achieving such transport sustainability is tenable, especially in developing cities of Asia, such as Dhaka, where trip lengths are primarily short, around 2 to 2.5 km (DUTP 1998 & Bari & Efroymsen 2007) and where NMT already has a dominant share in the overall traffic composition. Kubota & Kidokoro (1996) emphasized this dimension stating that, though the number of motorized vehicles will inevitably increase in most Asian cities, they cannot be treated as a separate alternative to non-motorized transport. Rather, both of them, including public transport, should be treated together for balanced system development. World Bank-GEF (2003) also recommended a modal shift in developing countries to low emission, less polluting vehicles like NMT to achieve transport sustainability and reduce climate change effects. In addition, the failure in policies to ban and/or restrict NMPT over the years is evident from section 3 of this paper. All these highlight the necessity for planned incorporation of motorized and non motorized modes in the transport system of Dhaka.



#### 4.1 Socio-Economic Significance

Rickshaws also have a key socio-economic role to play in Dhaka. They are the preferred travel mode by vulnerable social groups - women, children and the elderly – due to their safety, security and comfort perspective. In addition, they provide an alternative to the high user cost for taxis and auto rickshaws, and to the poor operating characteristics of motorized public transport. Table 2 summarises the travel characteristics and modal preferences of different segments of the Dhaka population.

**Table 2: Travel Characteristics of Transport Market Segments in Dhaka and Corresponding Mode Preferences**

Market Segments	Modes Type Use	Dominant Mode	Usual Trip Destination	Trip Length
Commuter	●	Train (proposed), Bus, Micro bus	Employment centres/ CBD	Long
Intra-city working population	● ○	Train (proposed), Bus, Micro bus  Taxi, Auto rickshaw, Rickshaw  Car, Motorbike	Local and regional employment centres/ CBD	Variable (short -long)
Student population	● ○	Bus, Micro bus  Rickshaw  Car	Educational institutions	Variable (medium -long)
Non-working female &/with pre-school children	● ○	Micro bus,  Auto rickshaw, rickshaw  Car	local and regional centres & residential areas	short
Elderly Population	● ○	Auto rickshaw, rickshaw  Car	local and regional centres & residential areas	short
Unemployed	●	Bus, Micro bus,  Rickshaw	local and regional centres	variable (short -medium)

Source: Derived from STP (2005) and Critical Analysis

- Public Transport (Metro Train, Bus, Human Hauler, CNG Auto rickshaw, NMPT (Rickshaw) & Taxi)
- Private transport- (Car, Motorbike)

Rickshaw is also one of the most important sectors of the Bangladeshi **economy**. According to Gallagher (1992), rickshaws in Bangladesh contribute 34% of the value added from the transport sector to GDP and support 5 million people (4.5% of the population of Bangladesh). This value has substantially increased in recent years and in Dhaka alone has reached 2 million people. Recent research by Ali & Islam (cited in Wipperman & Sowula 2007) estimated that 6% of Bangladesh's GDP can be accounted for by rickshaw pulling. In Dhaka alone, around \$300,000 is estimated to transfer between rickshaw pullers and passengers per day [Gallagher 1992; Ali & Islam study (cited in Wipperman & Sowula 2007)]. Such social and economic utility emphasizes the need for planned rickshaw incorporation. The preference

of this mode by the vulnerable social groups; especially women, children and the elderly population, on safety, security and comfort perspective enhances its social necessity.

#### 4.2 Employment Generational Effects

Rickshaw is also a substantial contributor to the **employment sector** of Bangladesh including Dhaka. It is estimated that there are around two million rickshaw pullers across Bangladesh (Ali & Islam as cited in Wipperman & Sowula 2007) and that around 14% of the Bangladeshi population relies indirectly on rickshaw pulling for their livelihoods (their families, manufactures, garage owners, painters, repair men) (Wipperman & Sowula 2007). In Dhaka alone, 20% of the population relies on pulling or indirectly, which amounts to about 2.5 million people (Wipperman & Sowula 2007). It cannot be overstated how crucial the rickshaw is to employment and the socio-economic structure of Bangladesh, especially amongst the poorest sections of society. This must be an important consideration in transport planning for the future of Dhaka.

#### 4.3 Eco-Sustainability

The DUTP project performance assessment report (2007) demonstrated that, reduction in rickshaws led to an increase in the number of mini-buses operating in Dhaka as a stop-and-go service that passengers could request to stop at any point along the NMT corridor. This has added considerably to air pollution. This is in addition to the general gross emission aggregated by the introduction of new motorized vehicles, replacing fuel free NMVs like rickshaw. Hoque, Khondaker & Alam (2005) also emphasized that the car is the principal contributor of SO<sub>x</sub>, NO<sub>x</sub> and CO emission in the city. The contributions from bus and truck are significant in the case of SO<sub>x</sub> and NO<sub>x</sub> emission. Auto rickshaws contribute significantly in the case of SO<sub>x</sub> and CO emission. By contrast, the NMVs including rickshaw have almost negligible impact on climate change and thereby are most desirable ecologically. The comparative fuel usage and type of different modes in Dhaka are depicted in Table 3.

**Table 3: Transport Modes in Dhaka City based on Mechanics and Fuel Usage**

Travel Mode	Type		Fuel Usage					
			Motorized	Non-motorized	Fuel Dependent			Fuel Free
					Fossil Fuel	Natural Gas	Hybrid	
<b>Passenger</b>								
Metro Train (proposed)	●		●					
Bus	●		●		●			
Micro bus	●		●		●			
Auto rickshaw	●			●				
<b>NMPT (Rickshaw)</b>		●				●		
Taxi	●		●		●			
Car/Jeep	●		●		●			
Motorbike	●		●					
Bicycle		●				●		
<b>Freight</b>								
Truck	●		●					
Rickshaw van		●				●		
Pushcart		●				●		

Source: Derived from STP (2005) and critical analysis

#### 4.4 City User's Travel Behavior and MT-NMT Integration

##### 4.4.1 Trip Share and NMPT Dominance

Available statistics clearly demonstrate rickshaw as one of the most popular mode of transport in Bangladesh, particularly Dhaka. Table 4 shows the modal shares of NMPT, public transport (bus) and private motorised transport over others in last few decades. The trends are shown in Figure 3.

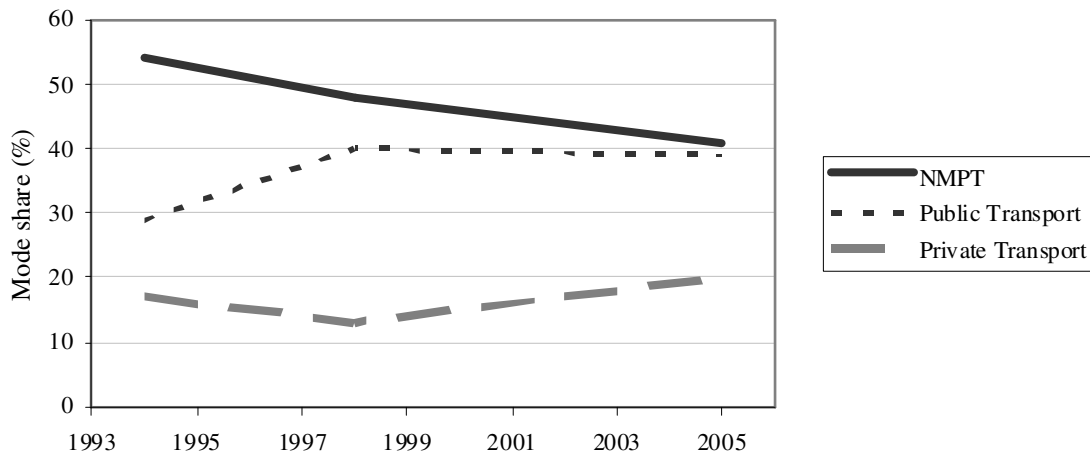
**Table 4: Comparative Trend of Dhaka Traffic Based on Primary Non-Walking Trip Share**

Travel Mode	Trip Share (%)		
	1994 (DITS)	1998 (DUTP)	2005 (STP)
Private transport and Paratransit	17	13	20
Public Transport	29	40	39
Non Motorized Public Transport	54	48	41
Sub-total	<b>100</b>	<b>100</b>	<b>100</b>

Source: Derived from DITS 1994, DUTP 1998, STP 2005 and Critical Analysis

**Note:**

Public Transport – Bus (large, mini, micro),  
Paratransit - Taxi, Auto rickshaw, NMPT (Rickshaw and Rickshaw van), Bicycle  
Private transport- Car, Motorbike



**Figure 3: Primary Non Walk Trip Share for Dhaka: Comparative Trend**

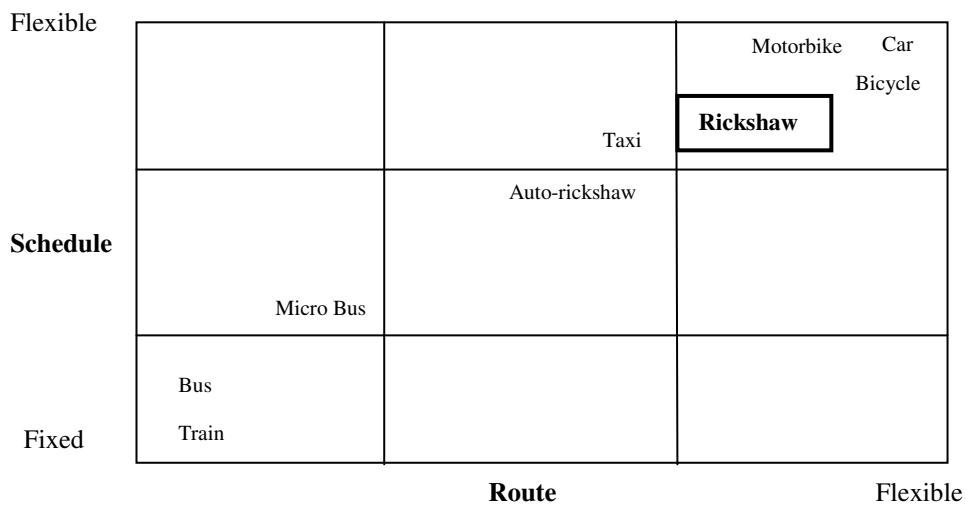
The above table and figure indicate rickshaw and bus as the two most used modes in Dhaka over last two decades. The trend also indicates gradual rise in private transport and motorised public transport. Although the mode share trend is downward for NMPT, it still has the highest mode share and in terms of total volume of trips, is still growing. The rise of private vehicle is also significant. It is to be noted that the recent strategic transport plan for Dhaka (STP) has suggested consideration of mass rapid transit (train) to be introduced as part of the 20 year master plan (2005-2025). The need to provide access to this mode, with limited corridors and pick-up/drop-of points will also require strong feeder services. Rickshaw may be the best option to fill that future need.

#### 4.4.2 Comparative Mode Operational Characteristics and NMPT Utility

The role that NMPT rickshaw plays in the transport system of Dhaka and its performance in comparison to other modes plying Dhaka roads can be best articulated through examination of some key operational characteristics.

##### ▪ Route Choice and Scheduling

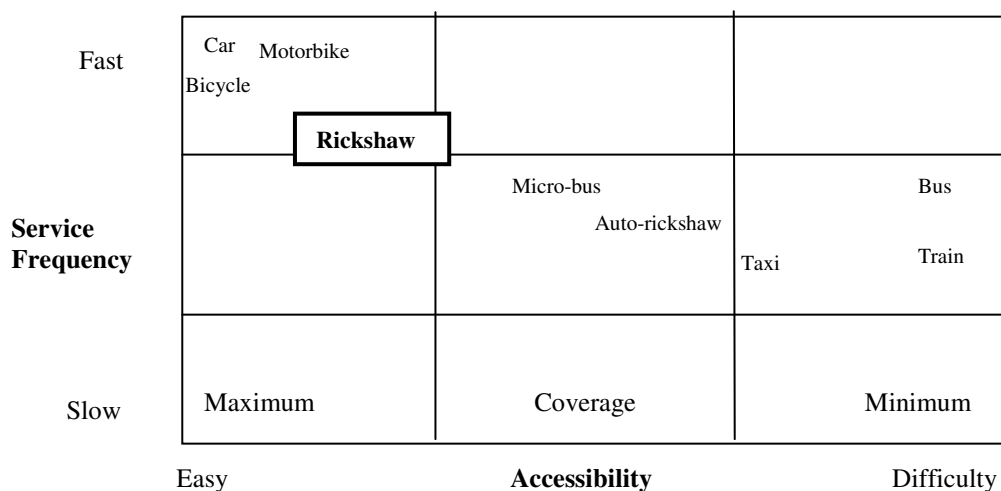
The route choice flexibility of rickshaw is greater than any other public transport and paratransit in operation and its highly convenient time schedule is unique to all other non private modes (Figure 4).



**Figure 4: Route Flexibility Vs Time Schedule for Different Modes**

##### ▪ Accessibility

The easy access and widespread coverage of rickshaw compared to the limited coverage and difficult access to other comparative public transport modes and paratransit makes it more desirable as primary travel mode for certain daily trips and supporting mode for many other trips (Figure 5).



**Figure 5: Accessibility Vs Service Frequency for Different Modes**

▪ **Operating Speed and User Cost Compared to Dominant Trip Length**

Rickshaw provides a unique public transport option for Dhaka's trip makers with reasonable fare and moderate speed for short distance travel. Figures 6 and 7 clearly show that rickshaw is the only public transport mode with short length trip making capability; unique and suitable to the general trip length character of Dhaka (2 to 2.5 km). And since the costs incurred to the users are moderate over a shorter distance, it is affordable. For many social groups, these attributes make rickshaw preferable to bus/microbus and auto rickshaw/taxi respectively. Although the operating speed is on the slower side, it is often traded off when considering the trip length and comparing the transfer time required for motorized public transport modes.

▪ **Travel Time and Service Quality in relation to Incurred User Cost**

The travel time of rickshaw is higher compared to bus or auto rickshaw, but this often exerts less significance due to the short distance trip making and it is preferable to buses in shorter travel instances (Figure 8). Moreover, as the user cost incurred is lower than auto rickshaw or taxi, rickshaw is preferred by many users (Figure 8).

The combination of moderately acceptable service quality within reasonable cost range, privacy and sense of security compared to other non private modes (Figure 9), also makes rickshaws popular to the common populace.

The above statistical and graphical analysis and the following table (Table 5) highlight the unique combination of attributes that rickshaw possesses as a passenger transport mode, and the vacuum in demand that would occur if it was removed as a transport option. In addition, the role NMPTs play as short distance and individual/ personal freight carrier is also unique. All these traffic operational characteristics when combined with social acceptability, economic importance and eco-friendliness of the mode reinforce the integration necessity of rickshaw in the transport system of Dhaka.

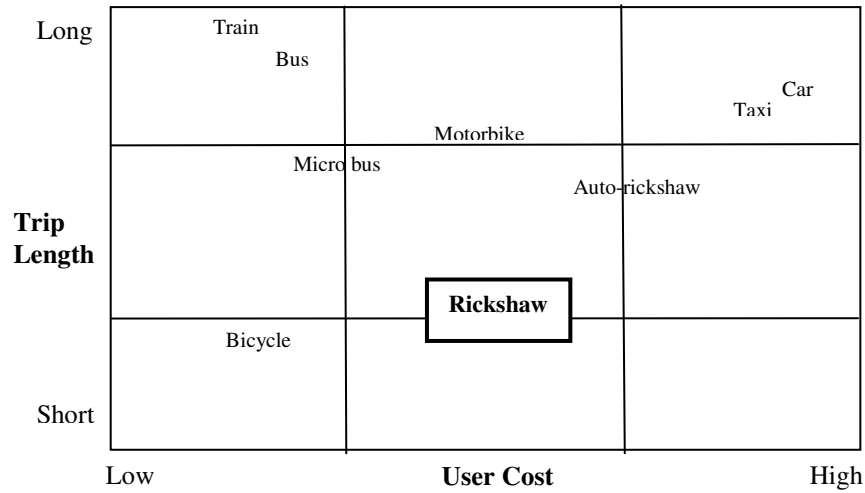


Figure 6: User Cost Vs Dominant Trip Length for Different Modes

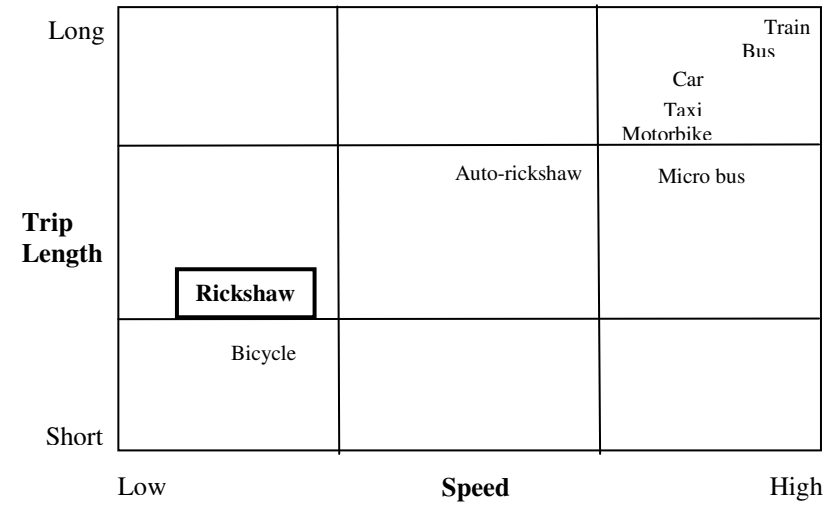


Figure 7: Vehicle Speed Vs Dominant Trip Length for Different Modes

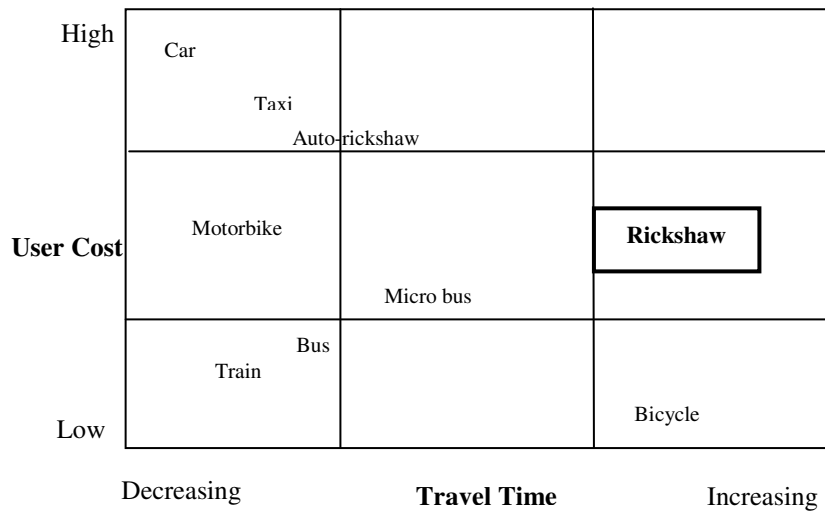


Figure 8: Travel Time Vs User Cost for Different Modes

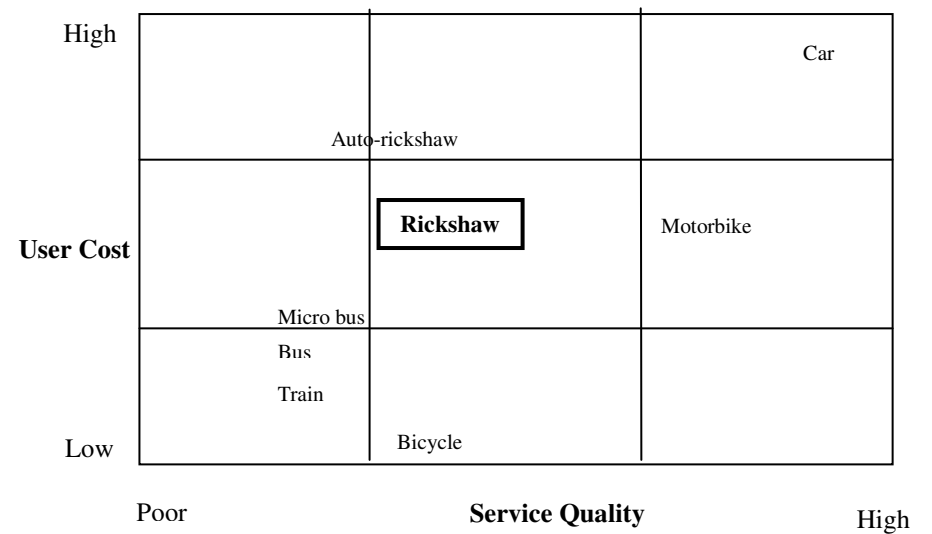


Figure 9: Service Quality Vs User Cost for Different Modes

**Table 5: Traffic Operational Characteristics of Rickshaw in Comparison to Remaining Modes**

Travel Mode	Operational Characteristics							
	Route Flexibility	Schedule Rigidity	Ease of Access	Capacity	Service Freq	Speed	User Cost	Dominant Trip Length
<b>Transit</b>								
Metro Train (expected)	○	●	○	●	⊙	●	○	●
Bus	○	●	○	●	⊙	●	○	●
Micro bus	○	●	○	⊙	⊙	●	○	⊙ ●
<b>Para transit</b>								
Auto rickshaw	⊙	○	⊙	○	○	⊙	⊙	⊙ ●
<b>Rickshaw</b>	●	○	●	○	●	○	⊙	⊙ ○
Taxi	⊙	○	⊙	⊙	○	●	●	●
<b>Private</b>								
Car	●	○	●	⊙	●	●	●	○ ⊙ ●
Motorbike	●	○	●	○	●	●	⊙	○ ⊙ ●
Bicycle	●	○	●	○	●	○	○	○

Source: Derived from STP (2005) and Critical Analysis

○ Low   ⊙ Medium   ● High
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## 5. FUTURE DIRECTIONS

### 5.1 Initiatives towards Integration between Motorized Transport and Non- Motorized Transport

The discussion so far has demonstrated that private NMVs (like bicycles) and NMPT (like cycle-rickshaws and rickshaw vans) are not a substitute for motorized public transport. Instead, they are complementary and partially overlapping modes of transport. Each has unique strengths and weaknesses. In combination, they offer strong potential competition to private motorized transport for variable trip dimensions in developing cities of the world. Therefore, instead of enforcing policies to eliminate non-motorized modes, more attention should be paid to the integration of motorized and non-motorized modes, such as encouraging bicycle and cycle-rickshaw as access modes to express transit services for longer distance trips. For Dhaka, it should also be noted that rickshaw as NMPT are not the major cause of congestion, and that replacement of rickshaws with motorized transport may have a detrimental impact, especially from road space occupancy and environmental perspectives. The prime example of such failed transport policy initiatives are Bangkok, Manila and Jakarta

(GTZ 2003). These factors also indicate the necessity that management and integration of rickshaw transport in Dhaka and other Bangladeshi cities are required to achieve a successful and sustainable city system.

In Western Europe and Japan, the bicycle has recently become the fastest growing and predominant access mode to suburban railways (Replogle 1992). In India, bicycles play a major role in access to commuter railways (Replogle, cited in Tiwari 2002). The Bogotá transport model is considered by many researchers like Hidalgo (2002), Bari (2003) and Joewono & Kubota (2005) as highly successful, sustainable urban development models in recent years promoting NMT and public transport while restricting cars. Bari (2003) stated that this model is under active consideration for implementation in a number of African developing cities like Cape Town, Dakar and Accra. He went on highlighting that the Bogotá approach demonstrated how NMVs, pedestrian mobility and public transport facilities could be integrated for the development of sustainable transport system and is worthy of exploring to cities like Dhaka. The integration lessons from Delft, Netherlands incorporating motorised modes, NMV (bicycle), pedestrians, mass public transit and water transport within an integrated transport network is also worth mentioning while we analyse the MT-NMT integration possibility for Dhaka. The plan for Tama New Town in Tokyo, which provides for pedestrian and bicycle access to town centres and railway stations completely segregated from vehicular road traffic, is also worth mentioning (World Bank 2002).

However, all these are examples of integration between motorized public transport and private NMVs. The scenario is somewhat different for Dhaka where integration demands are between motorized transport and NMVs including NMPTs (rickshaws). Therefore, while taking lessons from the successful integration instances elsewhere, it is necessary for Dhaka to devise a functional and indigenous integration mechanism that is contextual to the traffic characteristics and travel demand while facilitating the majority of the transport users.

## **5.2 Present Focus and Future Approach**

This research paper has focused on and critically analysed the questions relevant to ‘what role does rickshaw play in the overall transport spectrum of Dhaka?’; ‘what are the problems and opportunities relevant to rickshaw as a mode of transport and regarding integration in the mixed traffic stream?’; and on the debate ‘whether the existence of rickshaw is essential or detrimental in the transport system operation’?

The findings and analysis so far clearly indicate that rickshaws have a continuing and unique role to play in the Dhaka transport system, and can make an effective and functional contribution towards sustainable transport system development for Dhaka. The obvious questions that then arise are:

- if we accept that there is a future role of NMPT in the transport system of developing cities, what is that role?
- ‘where is future place rickshaw might have in the mixed traffic environment of Dhaka’?
- ‘how do we rationally attain that place?’
- what are the external factors to deal with while developing a mechanism, if applicable, for ‘real’ integration of the motorized and non-motorized modes?
- what technique(s) of such integration is rational while providing best functionality?
- what should be the modal priorities of the decision makers in the future transport system planning of developing cities?



No research has so far addressed these key issues in an integrated fashion. Our future research will therefore look into such unexplored attributes of this hotly contested issue, especially on developing a suitable mechanism for functional integration of NMPT (rickshaw) with motorized vehicles in the ever increasing traffic volume of Bangladesh with Dhaka as a central focus.

## 6. CONCLUDING REMARKS

This paper has delineated the directions in which the transport systems of many developing cities are heading, and has investigated the degrees and patterns of NMPT's contribution to the overall transport system of Bangladesh, with Dhaka as a central focus. Facts and figures have clearly demonstrated the crucial place rickshaw holds as a primary mode of travel for many citizens covering substantial market segments. As a result, and especially considering the travel utility, economic role, extent of workforce involvement, population dependence, eco-friendly nature, equity contribution and freight usage of rickshaws, it is clearly necessary to integrate MT-NMV policies and initiatives.

Having established the present contribution of NMPT and its integration with the overall transport system, future research on a number of highlighted issues will examine operational optimization of NMPT and development of a sustainable transport network for Dhaka. Such comprehensive attention to NMT as part of a national strategy, and local planning for implementation, are essential for reliable functioning of the existing transport system and to assist in reducing the non-equilibrium condition between motorized and non-motorized modes of transport in developing cities with similar traffic characteristics and composition.

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