

REVERSIBLE LANE: GLOBAL PRACTICE AND POSSIBILITIES IN BANGLADESH TO REDUCE TRAFFIC JAM

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ABSTRACT

Dhaka, capital of Bangladesh, is the most densely populated city in the whole world and traffic is an enormous problem here. Many survey and discussion have been made to find out the cause of traffic jam and how can it be reduced. In the past few years many steps have been taken by the Government and relevant authorities such as- construction of new flyovers, widening the road width, banning rickshaw from VIP roads, introducing separate lane for different vehicles, controlled movements of trucks and long-route buses in Dhaka city, introducing one way road system etc. But still now traffic jam is at same condition and increasing day by day. Urban planners and expertise suggest to build underground metro rail system or elevated express way. But it will take long time and huge budget to complete. So how can we improve present condition within the limited infrastructure and resources? In this paper I have tried to discuss some common thinking about traffic jam, its causes, impact and solutions. Then I have shown the problem in a different way and given a possible solution for it. That is- REVERSIBLE LANE SYSTEM, which has been used world-wide for over 75 years and is identified as one of the simplest, yet design-intensive lane management technique for congestion mitigation.

KEYWORDS: Traffic Jam, Dhaka City, Reversible Lanes

INTRODUCTION

Traffic congestion in cities is a global problem, and has been addressed mainly in two different ways: by creating more space and infrastructure for cars while banning other vehicles, and by reducing the space and infrastructure for cars while improving the situation for walking, cycling and public transit. The former approach has been shown to lead to great expense, more pollution, and increased congestion, while the latter approach has succeeded in resolved three wherever it has been implemented. In Dhaka, many studies, plans and projects have been undertaken costing crores of taka to reduce the congestion level, while ignoring international experience in terms both of what works and what doesn't. If the present condition is considered to be the outcome of projects taken in the recent past, the effectiveness of those previous projects faces serious question.

Several steps have been undertaken to reduce traffic congestion in Dhaka city, such as imposing restriction on the entrance of trucks in Dhaka during daytime, banning of cycle rickshaws in different roads, changing the time table of the trains, changing the lanes of public transport, construction of foot over bridges rather than zebra crossings, construction of flyovers, and so on. In addition, a traffic signal system was introduced, investing a huge amount of money. Though buses, trucks, rickshaws, trains and pedestrians have all been blamed for the congestion in Dhaka, after imposing restrictions on them the congestion level did not reduce. Despite the lack of success to date, some private organizations are keenly interested to introduce new projects without considering their likely effects. In this regard it is important to understand the reasons for ongoing congestion and the mechanisms likely to reduce it before undertaking new projects in the transport sector.

A wide variety of techniques have been developed in developing countries to mitigate the effects of traffic congestion. These have ranged from technically sophisticated systems such as real-time adaptive traffic signal control to in-vehicle dynamic route guidance to demand management initiatives like car pooling. Another technique that has been used in many countries since the 1920s is reversible traffic operations (Dorsey 1948). Reversible lanes systems (RLS) are an interesting concept because they can often significantly increase the capacity of a roadway, while often requiring little investment in roadway or control infrastructure. Their fundamental objective is to take advantage of underutilized lanes (or shoulders) in one direction of travel by reorienting the direction of traffic flow in the opposite direction, thereby increasing the overall capacity of the roadway. They have been used throughout the world, most commonly to increase directional roadway capacity during peak commuter periods, planned events, temporary construction periods, and emergency events (Wolshon, 2006)

LITERATURE REVIEW: CURRENT SCENARIO OF DHAKA CITY

Md. Asadullah Khan has described the scenario of traffic jam in Dhaka city in Daily Star with the title “When shall we get rid of Dhaka city traffic jam?”, published on October 20, 2007 (Khan, 2007). According to him with a huge fleet of cars, buses and all other types of vehicles gridlocked near a rail gate or road intersection sometimes even for 30 minutes at a stretch. People are afraid to get out of their houses because the journey from home to office or business centre takes away the vital hours that he could devote to his work. Other than being late in the offices, work places or on any scheduled appointments, mental disgust, exhaustion and loss of effective man hours is a colossal drain on the resources of the whole country.

A.H. Jaffor Ullah (Ullah,2001) admits this fact that traffic hardly moves in Dhaka’s main artery during rush hours. Many folks from mercantile community would prefer to leave their house late in the morning to simply avoid the all too familiar rush hour traffic jams. But their number is few and far between. Most Dhaka folks who work in government offices, schools, and other offices have no choice but to hit the road during the morning rush hour. These folks obviously take the brunt of rush hour traffic jam.

Syed Saiful Alam Shovan (Shovan,2008) has shown interesting findings on fuel consumption and environmental impact of rickshaw banning in Dhaka City. Most trips in Dhaka are short in distance, usually one to five kilometers. These trips are perfect for Rickshaws. Rickshaws are cheap and popular mode of transport over short distances. Rickshaws are safe, environmentally friendly and do not rely on fossil fuels. In Dhaka alone, Rickshaw pullers combine to earn 20 million taka a month. Rickshaws are ideal for urban settings because they can transport a relatively large number of passengers while taking up a small portion of the road. In 1998 the data showed that Rickshaws took up 38% of road space while transporting 54% of passengers in Dhaka. The private cars on the other hand, took up 34% of road space while only transporting 9% of the population (DUTP, 1998).

This data does not include the parking space on roads that cars take up in Dhaka. If included this would further raise the amount of space taken up by private cars. Every year the Rickshaw saves Bangladesh 100 billion taka in environmental damage. The government makes many efforts to reduce traffic congestion in Dhaka but with no success. Blaming Rickshaws for traffic congestion and subsequently banning them from major roads has not had the desired effect. Traffic is still as bad now as it was before the Rickshaws were banned on major roads.

TRANSPORT MEDIA AND TRANSPORTATION SYSTEM OF DHAKA CITY

Dhaka has 1,868 kilometres (1,161 mi) of paved roads (Ahmed, 1986). It is connected by highways and railway

links to Chittagong, Khulna, Mymensingh, Rajshahi, Faridpur and Sylhet. Highway links to the Indian cities of Kolkata and Agartala have been established by the BRTC which also runs regular bus services to those cities from Dhaka. The Kamalapur Railway Station and the Airport (Biman Bandar) Railway Station are the main railway stations providing trains on suburban and national routes operated by the state-run Bangladesh Railway (McAdam, 2004). The Sadarghat Port on the banks of the Buriganga River serves the transportation of goods and passengers upriver and to other ports in Bangladesh Economic and Social Commission for Asia and the Pacific. (2005 Economic and Social Commission for Asia and the Pacific, 2005). The Zia International Airport is the largest and busiest in the nation (Alam, 2003). A recent survey (By Mahmud, 2012) shows the main transportation mediums that are used in Dhaka City are—Public Bus, Rickshaw, Taxi, Private Car, and Motor cycle.

CAUSES OF TRAFFIC JAM: RECENT RESEARCH

To find out the causes of traffic jam, many research and surveyed has been conducted from many years. The most recent survey was done by Khaled Mahmud, Khonika Gope and Syed Mustafizur Rahman Chowdhury in 2012 (Mahmud, 2012). According to the survey main causes of traffic jam in the streets of Dhaka City are –

- Lack of law implementation and hence traffic rules violation,
- Lack of Planning of city road- one sided development (North-South direction),
- Insufficient road and low road space,
- Unplanned stoppage/ parking,
- Excessive vehicle on the road with different speed vehicle,
- Over population,
- Lack or driving training/ sense,
- Inadequate traffic management with inefficient traffic police,
- Reckless driving,
- Lack of Integration among various authority,
- Footpath occupied by hawkers,
- Poor signaling system,
- Road excavation,
- Rickshaw in main road etc.

SOLUTION OF TRAFFIC JAM

There are lots of solutions. Some are short term and some are long term basis. We need to work on the basis of long term plan and at the same time take care of short term solution to remove current discomforts or problems. It needs a balance so that to fulfill too much short term solution we do not ruin the long term plan.

In the following are some *short term strategies* that can be taken care of –

- Increasing pedestrian facilities,

- Maximum use of road width,
- Controlling road side activities,
- Modern signaling system,
- Speed wise dedicated road for vehicles,
- Car free days,
- High Parking charge,
- Discourage private cars,
- Time rescheduling,
- TIA (Traffic Impact Assessment) before plan pass of any construction,
- Increase the number of public vehicle, and
- Training of traffic polices.

Similarly we can Work on some Midterm Strategies, which can be Taken Care of within 5 to 10 Years, are given below

- BRT (Bus Rapid Transit),
- Central authority to control traffic of Dhaka City,
- Construction of roads through East-West,
- Adequate parking facilities,
- Circular embankment-cum-road along periphery of Dhaka City,
- Connecting the missing links of important roads, and
- Improving the efficiency of railways and river ferries.

For Long Term Solution we Have to Think of Implementing

- Environment sustainable transport,
- MRT (Mass Rapid Transit), and
- Grade separated road network.

LANE MANAGEMENT SYSTEM: REVERSIBLE LANE

The Federal Highway Administration has defined managed lanes as “highway facilities or a set of lanes where operational strategies are proactively implemented and managed in response to changing traffic conditions” (FHWA,2004). They are documented to be used in many countries including Australia, Canada, France, Italy, Malaysia, Spain, Sweden, United Kingdom and the United States of America (TTI, 2010). The most common and unnoticed of its implementation is restricting on-street parking during peak hours to open up lanes for traffic. Other types of lane management include High Occupancy Vehicle (HOV) lane operations, lane reversal, tidal flow operations, contra-flow operations and off-centre operation (Wolshon, 2004).



Figure 1: Bay-Bridge



Figure 2: Rock Creek Park

What is Reversible Lane (or Lane Reversible System)

Reversible lanes are a type of managed lanes which is assumed by Institute of Transportation Engineers to be one of the most effective methods to increase peak-hour capacities of roadways (Wolshon, 2006). It is defined as the type of roadway in which one or more lanes or lane-segment reverses its flow direction to accommodate changes in direction of peak traffic flow (AASHTO, 2004). A **reversible lane** (British English: **tidal flow**) is a lane in which traffic may travel in either direction, depending on certain conditions (Wikipedia, 2013).

Reversible traffic lanes add peak-direction capacity to a two-way road and decrease congestion by borrowing available lane capacity from the other (off-peak) direction. Reversible lanes are also commonly found in tunnels and on bridges, and on the surrounding roadways – even where the lanes are not regularly reversed to handle normal changes in traffic flow. The presence of lane controls allows authorities to close or reverse lanes when unusual circumstances (such as construction or a traffic mishap) require use of fewer or more lanes to maintain orderly flow of traffic . It is being used from road with 3 lanes to road with 8 lanes in about 53 locations of different countries.

Properties of Reversible Lane

Most reversible lanes serve to accommodate unbalanced traffic volume during one of the three following scenarios: peak-hour traffic, after-event traffic or emergency evacuation. They switch the direction of service after certain duration. Hence, reversible lanes have two kinds of properties: spatial and temporal (Wolshon,2004). Spatial characteristics define how the transition is from a non-reversible segment to a reversible segment and back. Temporal characteristics define how the direction of flow is divided between various durations. Apart from these characteristics, reversible lanes are also defined by the type of lane control (overhead signals, roadside signage, special pavement marking etc.) and also the presence of any physical separation from normal lanes (using movable barriers or non-movable barrier with movable gates etc.).

Scope of Use

Reversible Lane is Basically used to:

- Reduces congestion for handling special event traffic,
- Increase directional traffic flow in peak-hours (Basically morning and evening),
- Divert traffic flow when construction or maintenance activity is present on the road,
- For emergency evacuation,
- For the security of VIP person.

REVERSIBLE LANE AND TRAFFIC JAM OF DHAKA CITY

To Increase Directional Traffic Flow in Peak-Hours (Basically Morning and Evening)



Figure 3: Traffic Flow at Morning in Mirpur Road, Source, Google Map, (10-02-2013)

Dhaka city is the main business hub of Bangladesh. All most Each company has more than one offices in Dhaka. Most of the offices are located in Motijheel, Gulshan, Bonani, Mirpur, Kawran Bazar and Uttora. Every day many people travel from home to these area for office and return at evening. So we observe directional flow of traffic in peak hours.

In Figure 3 we can see the traffic pattern of Mirpur road from Manik Mia Avenue to Elepahnt. About 3 kilometers of the road is seen with traffic going towards Shahabag-Motijheel, whereas opposite Direction is almost empty. Reverse situation is seen at evening when people return home. In this case if we can increase one lane to the peak hours direction through reversible lane, it will help to increase traffic flow and will maximize the best use of available road space.



Figure 4: Procession in Dhaka City

To Reduces Congestion for Handling Special Event Traffic

- Bangladesh is a democratic country. For any type of protest people of Dhaka used to gather Procession/Rally. In this time one side of road is entirely blocked by them and create traffic jam. We can use reversible lane system to maintain traffic flow on both side of road In this case.
- On each Friday, roads in front of mosques in Dhaka is blocked by the Muslims for Jumma prayer. In this case we can use reversible lane system to maintain traffic flow on both side of the road.
- After football or cricket match which held in Mirpur Stadium or in Bangabandhu Stadium, reversible lane system can be used to evacuate the stadium immediately while maintaining normal traffic movement.



Figure 5: Recent Picture of Shayamoli-Adabar Road

To Divert Traffic Flow when Construction or Maintenance Activity is Present on the Road

Road repairing, construction and digging for maintenance is a common scenario in Dhaka city. Different utility and maintenance authority of Dhaka city (WASA, DECA etc.) do not synchronize their work with each other. So almost the whole year people of Dhaka city have to suffer for the digging of road and traffic jam for it. Reversible lane can help to maintain both side traffic flow smoothly and reduce traffic jam in this case.



Figure 6: Road Vacant for VIP Movement

For Emergency Movement

Sometimes Ambulance, Police vehicle and Fire brigaded car has to stuck in traffic jam for hours. Many valuable lives suffer for this traffic jam. Reversible lane can be used for free movement of this life saving vehicles easily and can save many valuable lives.

For the Security of VIP Person's Movement

Security of any VIP person in developing country is a vital issue. In Dhaka, when Prime-Minister move from one place to other place, lane for his/her movement get evacuated for at least 20 minutes. As a result people have to suffer for about 1 hour traffic jam. For any VIP person's passage similar situation happened. Reversible lane system can make this process easy and reduce traffic jam.

HOW TO APPLY REVERSIBLE LANE IN DHAKA CITY (DESIGN GUIDE LINE)

Primary issue with regard to reversible lanes is safety and enforcement. For the same reason, they are rarely found in developing and underdeveloped countries in spite of the benefits it gives with respect to roadway width restrictions. But interesting fact that we are using reversible lane in Dhaka without any knowledge of it and without any proper system. Look at the Figure 7 and Figure 8.

I have taken this pictures from College Gate, Mohammadpur during last Hartal (Strike). In the day of hartal, traffic police usually block the road in front of Prime Minister's home (Gono Bhaban) for security purpose. Then the road in front of Residential Model College act as two way road. This is in fact called reversible lane. So we are actually using lane reversible technique from many years without knowing and applying the proper technique.



Figure 7: College Gate, Mohammadpur



Figure 8: College Gate, Mohammadpur

In developed countries lane reversible sometimes controlled with only overhead signal light. It is possible as the drivers follow the rules strictly. But in a developing country like Bangladesh only 70% of people are aware of traffic rules, only 13% of people follow traffic rules strictly. On the other hand, 47% people moderately follow traffic rules and 40% of people never follow traffic rules (Mahmud, 2012). So it is difficult to apply reversible lane safely for rush hours without proper controlling system. The following design guide line may help to maintain proper technique with safety.

Let us consider a six lane road running from 'A' to 'B' (Figure 9) where morning peak hour traffic is towards 'B' and evening rush hours traffic flow towards 'A'. For safety factor and controlling we are using a steel lane separator on both side of the road which separate the lane 2-3 and 4-5. Two hinged gate (Gate-01 and 04) are kept in the barrier according to the Figure 14 and two sliding gates (Gate-02 and Gate-03) are built along with the road island/Divider. The basic mechanism is -

- During morning peak hours (8.00 am-10.00am) when the main traffic flow is from 'A' to 'B', gate-01 and gate- 02 will be opened and, gate-03 and gate-04 will be closed. Then traffic towards 'B' will enter to the lane-03 through gate-02 and share it. Thus traffic towards 'B' will have four lanes and traffic towards 'A' will have two. At this time at 'B' end lane-01 and lane -02 will show green signal and rest of the light will show red signal.

- On the other hand during evening peak hours (5.00pm - 7.00pm) when the main traffic is towards 'A', gate-03 and 04 will remain open and gate-01 and gate-02 will be kept close. Thus traffic towards 'A' will share lane-04 and will use four lanes.
- Rest of the time during off peak hours all four gates will remain close and both direction will have 3 lanes each towards destination. For emergency purpose such as ambulance, it can use lane-03 or lane-04 for quick movement. At this time regular traffic will not enter lane-03 or lane-04 and it will be controlled through signal light.
- This process will also help to keep vehicles in proper track as lane separator is being used.

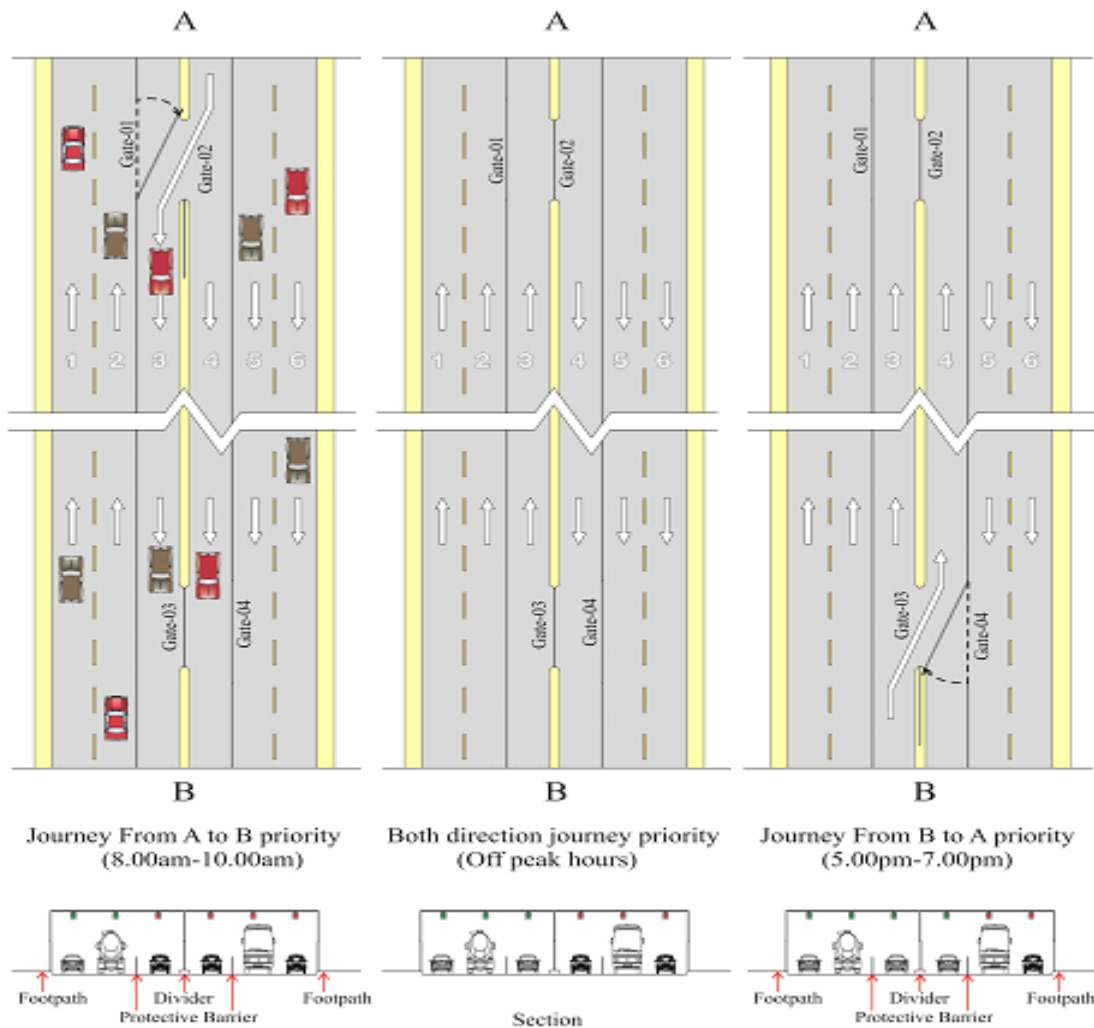


Figure 9: Simple Modified Way of Lane Reversible System for Dhaka City

CONCLUSIONS

Dhaka takes a vital role in the economy of Bangladesh. But now due to traffic jam, this City is causing the major loss in the economy of Bangladesh. By reducing traffic jam, this city can play a very important role for the country and at the same it can also bring relief and peace for the citizens by ensuring healthy environment free from noise and pollution. To ensure a healthy generation, traffic jam must be reduced. There are lots of solutions. Some are short term and some are long term basis. We need to work on the basis of long term plan and at the same time take care of short term solution to remove current discomforts or problems. Lane reversible system can often significantly increase the capacity of roadway, while often requiring little investment in roadway or control infrastructure. We can easily use it to reduce traffic jam. But

for this we need to develop public consciousness. Unless and until we change our perception and develop a mind to abide traffic rules, whatever strategy we take, that will not work properly. I believe, our law-abiding consciousness, good-intention and sincere co-operation can remarkably reduce traffic jam in Dhaka city.

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