

# Consensus building on Traffic Congestion Management in Central Dhaka

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Traffic congestion has now become a very serious problem in Dhaka city. It is because of the rapid socio-economic changes and increases in population, the city expanded dynamically without any planning and control. The transportation system of Dhaka city is predominantly road based where non-motorized transportation (mainly rickshaw) has a substantial share. The main problem of Dhaka city is traffic congestion and that occurs mainly due to the mixture of motorized and non-motorized transport on the same road space. This study find out the best solution for reducing traffic congestion in central Dhaka with respecting to residence, rickshaw driver and national government's opinions.

**Key Words:** *Consensus building, Traffic Congestion, Rickshaw*

## 1. BACKGROUND

Bangladesh is a populous country and Dhaka is the capital of this country, has to accommodate a large share of this population. Here population density is 23,029/km<sup>2</sup>. With a rate of increase of population at about 7% per year, Dhaka Metropolitan area is expected to become one of the largest cities within this century<sup>1</sup>.

The transportation system of Dhaka is predominantly road based where non-motorized transportation (mainly rickshaw) has a substantial share. So far traffic congestion has now become a very serious problem particularly in Dhaka. The traffic congestion occurs mainly due to the mixture of motorized and non-motorized transport on the same road space.

Several researchers studied on urban transport issues and improvement option for Dhaka and so on. Hoque et al.<sup>2</sup> discussed about the possible solution strategies for enhancing mobility, safety and the environment by means of better traffic management measures. Chonga et al.<sup>3</sup> explored death and morbidity data for the state of New South Wales, Australia to examine rates and severity of injury arising from collisions between pedestrians and cyclists, and between cyclists and motor vehicles. It was found that when cyclists collisions with motor

vehicles, collisions rate become higher than others. Alam<sup>4</sup> in his study said that vehicle emissions are increasingly being recognized as the dominant cause of air pollution and health problems in Dhaka. The pressing demands for motorized form of personal mobility are pressures on road network and resulting in congestion.

In this study a few immediate and possible alternative planning options is considered for evaluating which include different lane of rickshaw and cycle, banning of rickshaw from the main road and promote efficient public transports, and only rickshaw for the central part of Dhaka city. Here residence, rickshaw driver and national government's opinion is taken and the best selected solution is found out for reducing traffic congestion in central Dhaka with respect to their opinion.

## 2. PURPOSE OF THE STUDY:

Based on the background, the following objectives have been identified.

- (i) Regarding rickshaw, consensus building to Dhaka, Bangladesh is focused in order to reduce traffic congestion in central Dhaka.
- (ii) To identify the respondents opinions about

traffic congestion.

- (iii) To propose the best selected solution for reducing traffic congestion to the decision maker.

### 3. STUDY AREA:

Dhaka is a megacity and one of the major cities of South Asia. Also the most densely populated cities in the world. This study applied “Motijheel” one of the most important places in central Dhaka. Here traffic congestion is the matter of everyday. Because this place is commercial area and national stadium is close to this place. In this study considered 9km<sup>2</sup> land areas, which is shown in the Fig.1.

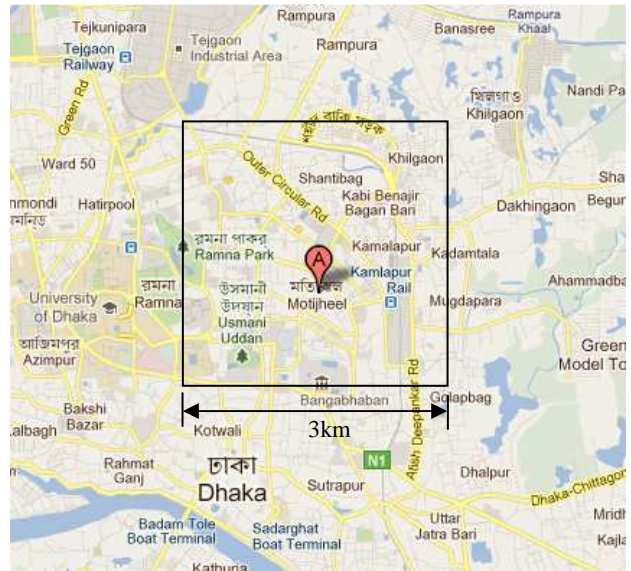


Fig. 1 Study area at the central part of Dhaka city

### 4. METHODOLOGY:

#### (1) Applying Fuzzy AHP

This study applied Fuzzy AHP for consensus building on traffic congestion management in central Dhaka. Fig.2 is the hierarchy chart. In the hierarchy chart four evaluation factors are considered. The evaluation factors are safety, travel time, economical impact and environmental impact. Those evaluation factors are considered from the following substances,

**Safety:** Traffic congestion sometime causes road accidents and people become injured. So, traffic congestion hampered safety.

**Travel time:** Everybody like short travel time. But due to traffic congestion, travel time become longer.

**Economical impact:** When the government introduce new transportation plan, social economical effect is important. For example time value, rickshaw drivers income, travel cost etc.

**Environmental impact:** Due to traffic congestion, the air pollution rate in Dhaka city increase day by day. And the pollution causes health hazard.

Among the four evaluation factors, three alternatives are considered. Those alternatives are “separate rickshaw from motor vehicle”, “banned rickshaw from main road and promote efficient public transportation” and “only rickshaw for the central part of Dhaka”. Figure3(a) showed the first alternative “separate rickshaw from motor vehicle”. In this case rickshaw is separated from motor vehicle by construct road divider on the road. Figure3(b) showed the second alternative “banned rickshaw from main road and promote efficient public transportation”, in this situation only motor

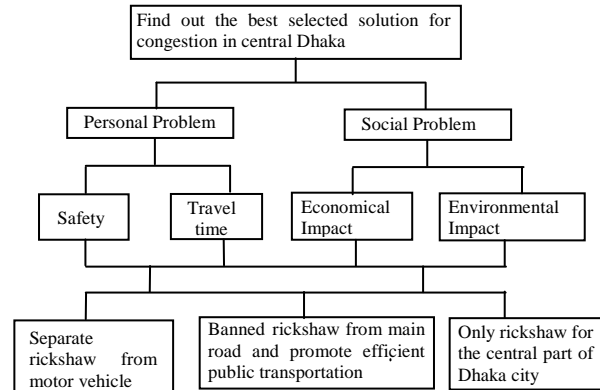


Fig.2 Hierarchy chart

vehicle move on the road and rickshaw is banned. Figure3(c) showed the third alternative “only rickshaw for the central part of Dhaka”, only rickshaw can move and motor vehicle can’t enter at the central part of Dhaka city.

#### (2) Outline of the questionnaire survey:

In this study the questionnaire survey was done by five members, from 2<sup>nd</sup> of June to 7<sup>th</sup> of June, 2011 at the central part and some other parts of Dhaka city. Totally 274 questionnaires were collected. Among 274 questionnaires 178 questionnaires from residents, 93 questionnaires from rickshaw drivers and 3 questionnaires were collected from national government.

### 5. ANALYZING FUZZY AHP

#### (1) Degree of importance of evaluation factors

In this study by analyzing the evaluation factors from residences, rickshaw drivers and national government’s found different types of results. From



a) Separate rickshaw from motor vehicle.



b) Banned rickshaw from main road and promote efficient public transport.



c) Only rickshaw for the central part of Dhaka city

**Fig.3** Alternatives

**Fig.4** it is found that for residence economical impact and safety are important but travel time and environmental impact are not so important. Most important factor for rickshaw drivers is economical impact, because of their poverty. Safety is their second important factor, because if due to accidents they get injured and can't drive rickshaw then their family can't manage food. But travel time and environmental impact are not so important for them. For national government the most important factor is economical impact, because 200 billion taka is lost every year because of staying longer time in the congestion. Environmental impact is second important factor for government, because traffic congestion causes highly air pollution in Dhaka. But safety and travel time are not so important for them.

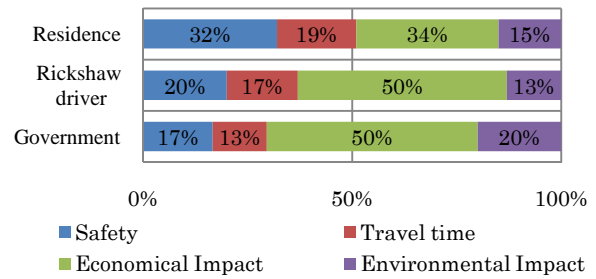
## (2) Evaluation of alternatives

Almost 1 million people go to central Dhaka every day. To move here and there in central Dhaka they use different types of vehicle. **Table 1** shows the modal share of residence at Dhaka from observed data.

By considering the factor safety, considered accidents rate. Rickshaws accidents rate is much lower than motor vehicle. And for travel time analysis considered velocity of the vehicles. Rickshaws velocity is lower than motor vehicle. For economical impact analysis considered travel cost, income loss or gain of rickshaw driver and time value. By considered environmental impact considered CO<sub>2</sub> emission rate from vehicle. In this study for analyze the alternative "separate rickshaw from motor vehicle", all types of vehicle can move in the central Dhaka. But for the alternative "banned rickshaw from main road and promote efficient public transportation", considered 50% of the residence travel by rickshaw before, will travel by bus and 50% will move by walking. And for the alternative "only rickshaw for the central part of Dhaka" considered the residence travel by motor vehicle before will travel by rickshaw. The results of evaluation of alternatives are shown in **Table 2**.

**Table.1** Modal share of travel vehicle at present

Mode of Travel	Modal share	Mode of Travel	Modal share	Mode of Travel	Modal share
Car	0.04	Tempo	0.06	Other	0.05
Bus	0.1	Rickshaw	0.13	Pedestrian	0.62



**Fig.4** Degree of Importance

**Table 2** Evaluation score of alternatives

	Safety	Travel time	Economical Impact	Environment: Impact
Separate rickshaw	0.25	0.27	0.14	0.14
Banned rickshaw	0.10	0.50	0.14	0.14
Only rickshaw	0.65	0.23	0.72	0.72

## (3) Evaluation by Fuzzy AHP

In this study for applied Fuzzy AHP use accountable degree of the evaluation factors. Accountable degree is the degree that evaluation factor can represent upper level purpose. **Table 3** shows accountable degree of the evaluation factor for the residence. By using the evaluation score of alternatives from **Table 2** and accountable degree of residence from **Table 3**, U, L, and N evaluation of the alternatives of residences are analyzed.

U-Evaluation : Calculation by using highest evaluation factor.

$$U(i) = \sum_{j=1}^n \Delta(j). \max f(i, k)$$

L-Evaluation : Calculation by using lowest evaluation factor.

$$L(i) = \sum_{j=1}^n \Delta(j). \min f(i, k)$$

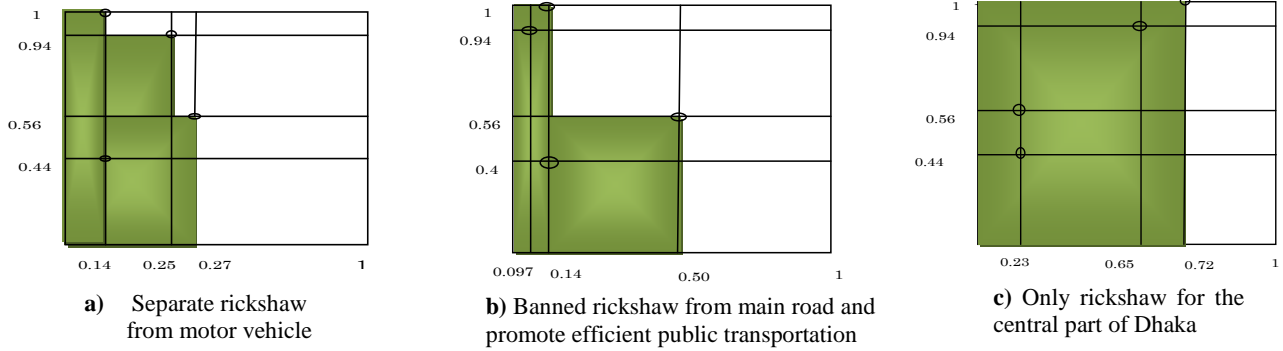


Fig.5 U-evaluation by residence

N-Evaluation: Intermediate between U and L-evaluation.

$$N(i) = \sum_{j=1}^n \Delta(j).meanf(i, k)$$

$j$ : Accountable degree (ascending order)

$n$ : number of evaluation factors

$E(j)$ : accountable degree of evaluation factor  $j$

$\Delta(j)$ :  $E(j) - E(j-1)$

$f(i, k)$ : alternative  $j$ 's weight for each evaluation factor

$k$  describes the evaluation factor that is  $E(k) > E(j)$

Figure 5 shows the U-evaluation of residence for “separate rickshaw from motor vehicle”, “banned rickshaw from motor vehicle and promote efficient public transport and “only rickshaw for the central part of Dhaka”. In the same way this study analyzed U, L and N-evaluation of the alternatives of the rickshaw drivers and national governments. Results of the U, L, and N-evaluation of the alternatives for residences, rickshaw drivers and national governments are shown in Table 4. By analyzing the questionnaire survey from residences, rickshaw drivers and national governments found that only rickshaw for the central part of Dhaka city will be the best solution to traffic congestion management which is shown in Table 4.

## 6. CONCLUSIONS

Under the pressure from World Bank, to reduce traffic congestion Dhaka City Corporation banned rickshaws from some important roads in Dhaka. But from this study it is found that only rickshaw for the central part of Dhaka city will be the best solution to traffic congestion management.

On the other hand by analyzing degree of importance found that economical and environmental impact is most important for government. If the alternative only rickshaw applying in central Dhaka then its economical impact will be more than other alternatives and

Table 3 Accountable degree by residence

	Importance degree	Accountable degree
Safety	0.32	0.94
Travel time	0.19	0.56
Economical Impact	0.34	1.00
Environmental Impact	0.15	0.44

Table 4 Results of analysis

		U-evaluation	L-evaluation	N-evaluation
Separate rickshaw	Residence	0.25	0.14	0.19
	Rickshaw driver	0.18	0.14	0.16
	Govt.	0.15	0.14	0.16
Banned rickshaw	Residence	0.34	0.10	0.22
	Rickshaw driver	0.26	0.12	0.19
	Govt.	0.23	0.12	0.18
Only rickshaw	Residence	0.72	0.39	0.57
	Rickshaw driver	0.72	0.55	0.64
	Govt.	0.72	0.60	0.65

rickshaw is eco-friendly; it does not create any air pollutions. For those reasons even though government wants to ban rickshaw, only Rickshaw for the central Dhaka city will be the best solution.

The main important point is that Bangladesh government does not consider that rickshaw is eco-friendly, they only consider that rickshaw take up too much road space and move more slowly than motor vehicle.

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