

ASSESSMENT OF TRANSPORTATION PLANNING FOR CENTRAL DHAKA

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ABSTRACT

Urbanization in Bangladesh has been increasing steadily over the last 10 to 20 years with current urbanization level. Bangladesh is a populous country and Dhaka is the capital of this country. Now a day's Dhaka becomes one of the most densely populated cities in the world. The rate of urbanization is alarmingly high when compared with other developing countries. The current rate of urban population growth in Bangladesh is found to be the highest in Asia. Due to high rate of urbanization traffic congestion rate also increase rapidly. It has been noted that the possible causes of increasing urban traffic congestion in Dhaka, Bangladesh are mainly attributed due to the different traffic mix and heavy concentration of non-motorized vehicles. At Dhaka city almost 70 percent of the available road space is occupied by rickshaws for the absence of a dependable public transport system. Only 10-20 percent of trips in Dhaka crated by bus and motorized para-transit modes. Non-motorized modes account for 80-90 percent of the daily total passenger trips. For the above reasons traffic congestion becomes one of the most important problems in Dhaka, Bangladesh. This study use Fuzzy theory on AHP analysis to evaluate the best way to reduce traffic congestion at central Dhaka from the view points of different types of people opinion. By observing the analysis results found that traffic congestion management in central Dhaka can be improve, if Dhaka city government applies the proposing procedure to build consensus between government and residence.

Keywords: Assessment, traffic congestion, build consensus

1. INTRODUCTION

Now a day's traffic congestion becomes a very serious problem for all over the world. In case of developed country, city planner try to solve the problem and most of the cases they can reduce the rate of traffic congestion. But the worst situation happen in developing country, city planner can't manage the problem properly due to the lack of resources. As a result residences suffer so much and the country loss economically at the every moment on the congestion. Dhaka is a mega city and one of the major cities of South Asia. It is the 9th largest city in the world and also 28th among the most densely populated cities in the world. The transportation system of Dhaka is predominantly road based where non-motorized transportation has a substantial share. So far traffic congestion has now become a very serious problem particularly in Dhaka and the traffic congestion occurs mainly due to the mixture of motorized and non-motorized transport on the same road space (Mannan and Karim, 2001). Under the pressure from the World Bank, Dhaka City Corporation (DCC) banned rickshaw from some important roads. The reasons given for the ban were that rickshaws cause traffic congestion because they take up too much road space and move more slowly than motor vehicles (Bhuiyan, 2007). The city is described as the rickshaw capital of the World, because 400,000 cycle rickshaws running on its streets every day. So traffic congestion becomes one of the most important problems in Dhaka, Bangladesh.

This study consider a few immediate and possible alternative planning options is considered for evaluating which include banning of rickshaw from the main road and promote efficient public transports or only rickshaw for the central part of Dhaka city etc. In this study public opinion is taken and the best selected solution is tried to find out for reducing traffic congestion in central Dhaka with respect to public opinion.

2. PURPOSE OF THE STUDY:

Based on the research background, the following objectives have been identified for the present research work:

- (i) Regarding rickshaw, want to focus consensus building 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 to reduce traffic congestion to the decision maker.

3. STUDY AREA

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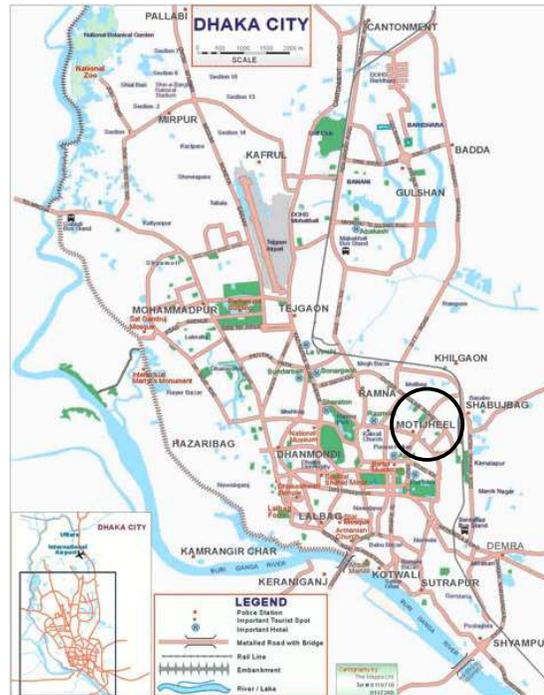


Figure 1: Study area at the central part of Dhaka city

Dhaka is a megacity and one of the major cities of South Asia. Located on the banks of the Buriganga River, Dhaka, along with its metropolitan area, has a population of over 12 million, making it the largest city in Bangladesh. It is the 9th largest city in the world and also among the most densely populated cities in the world. Total land area of Dhaka city is 304 km² and here population density is 23,029 /km². In this study considered one of the most important places in central Dhaka. Here traffic Congestion is the matter of everyday. This study considered 9 km² land areas from “Motijheel” which is one of the most important places in central Dhaka shown in Fig.1.

5. METHODOLOGY

5.1 Applying Fuzzy AHP for the case study

This study applied Fuzzy AHP for to build consensus for any kind of public policy and on traffic congestion management in central Dhaka. Figure 2 shows the hierarchy chart for the case study. In this study four evaluation factors are considered. The evaluation factors are safety, travel time, economical impact, and environmental impact. The evaluation factors are considered from the following substances, such as Safety: Traffic congestion sometime causes road accidents and people become injured. Therefore, traffic congestion hampered safety. Travel time: Everybody likes short travel time. However due to traffic congestion, travel time become longer. Economical impact: When the government introduces new transportation plan, social economical effect becomes important. For example people’s income, travel cost (Example: fare), time value etc. Environmental impact: Due to traffic congestion, the air pollution rate in Dhaka city increase day by day. The pollution causes health hazard. Among the four evaluation factors two alternatives are considered. Those alternatives are “banned rickshaw from main road and promote efficient public transportation” which is shown in Fig. 3(a) and “only rickshaw for the central part of Dhaka city” which is shown in Fig. 3(b).

4.2 Outline of the questionnaire survey for the case study

In this study questionnaire survey was conducted at the central part and some other parts of Dhaka city. Total 178 questionnaires were collected from residents and three questionnaires from government.

4.3 Analyzing Fuzzy AHP for the case study

This study analyzed the questionnaire from residences and national government and found different opinion or results from these two types of people. From Fig. 4, it is found that residence consider economical impact and safety are most important. Furthermore, the most important factor for national government is economical impact. Environmental impact is second important factor for government.

4.4 Evaluation of alternatives for the case study

Every day almost one million trips induce in 9 km² land area in central Dhaka. To move within central Dhaka residences use different types of vehicle. Table 1 shows the modal share of transportation at Dhaka for different alternatives. For analyzing the alternative “banned rickshaw from main road and promote efficient public transportation”, considered 40% of the residence travel by rickshaw before will travel by tempo, 20% by bus and 40% will move by walking. For the alternative “only rickshaw for the central part of Dhaka” considered 40% of the residence travel by bus or other public transport before will travel by rickshaw and 60% will move by walking. This study by considered the evaluation factor safety, considered accidents rate. Rickshaws accidents rate is much lower than motor vehicle. Travel time analysis considered velocity of the vehicles. Rickshaws velocity is lower than motor vehicle. Economical impact analysis considered travel cost, income loss or gain of rickshaw driver and bus service authority, and time value etc. Environmental impact analysis considered CO₂ emission rate from vehicle. By using these information’s and making pare comparison this study find out the results of evaluation factor’s score of alternatives which are shown in Table 2.

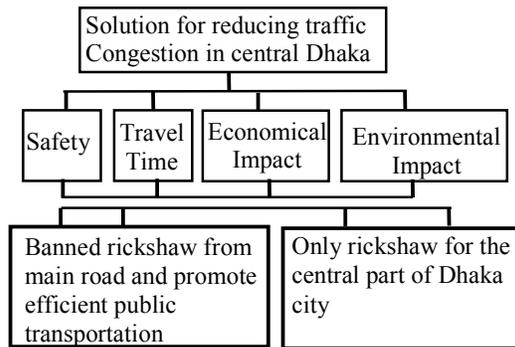


Figure 2: Hierarchy chart



(a) Banned rickshaw from main road and promote efficient public transportation

(b) Only rickshaw for the central part of Dhaka city

Figure 3: Alternatives

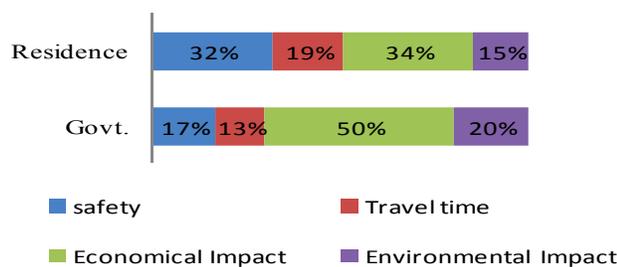


Figure 4: Degree of Importance

Table1: Mode of travel and modal share

Mode of Travel	Present Modal share	Banned Rickshaw	Only Rickshaw
Car	0.04	0.04	0
Bus	0.11	0.13	0
Auto-Rickshaw	0.06	0.12	0
Rickshaw	0.14	0	0.25
Pedestrian	0.65	0.71	0.75

Table 2: Evaluation factor’s score of alternatives

	Safety	Travel time	Economical Impact	Environmental Impact
Banned rickshaw	0.25	0.73	0.63	0.25
Only rickshaw	0.75	0.27	0.37	0.75

Table 3: Accountable degree by government and residence

Evaluation factor’s	Government		Residence	
	Importance degree	Accountable degree	Importance degree	Accountable degree
Safety	0.17	0.33	0.32	0.94
Travel time	0.13	0.26	0.19	0.56
Economical Impact	0.50	1	0.34	1.00
Environmental Impact	0.20	0.40	0.15	0.44

Table 4: Analysis result by Fuzzy AHP

		U-evaluation	L-evaluation
Banned Rickshaw	Residence	0.67	0.27
	Government	0.66	0.49
Only Rickshaw	Residence	0.73	0.31
	Government	0.52	0.34

4.5 Evaluation by Fuzzy AHP

This study analyzed by Fuzzy AHP uses 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 and government. By using Fuzzy AHP find out U & L-evaluation (Gokitani and Kishi, 2007). U and L- evaluation of the alternatives of residences and government are analyzed by using the evaluation factor’s score for alternatives and accountable degree of residences and government from Table 2 and Table 3, respectively.

U-Evaluation : Calculation by using highest evaluation factor & emphasize advantages.

$$U(A) = \sum_{i=1}^n \Delta_i \times \max(A_1, A_2, \dots, A_i) \tag{1}$$

$$U(B) = \sum_{i=1}^n \Delta_i \times \max(B_1, B_2, \dots, B_i) \tag{2}$$

L-Evaluation : Calculation by using lowest evaluation factor & emphasize disadvantages.

$$L(A) = \sum_{i=1}^n \Delta_i \times \min(A_1, A_2, \dots, A_i) \tag{3}$$

$$L(B) = \sum_{i=1}^n \Delta_i \times \min(B_1, B_2, \dots, B_i) \tag{4}$$

Where,

$$\Delta_i = E_i - E_{i+1} (E_{n+1} = 0)$$

$$A_i = A_1, A_2, A_3, \dots, A_i$$

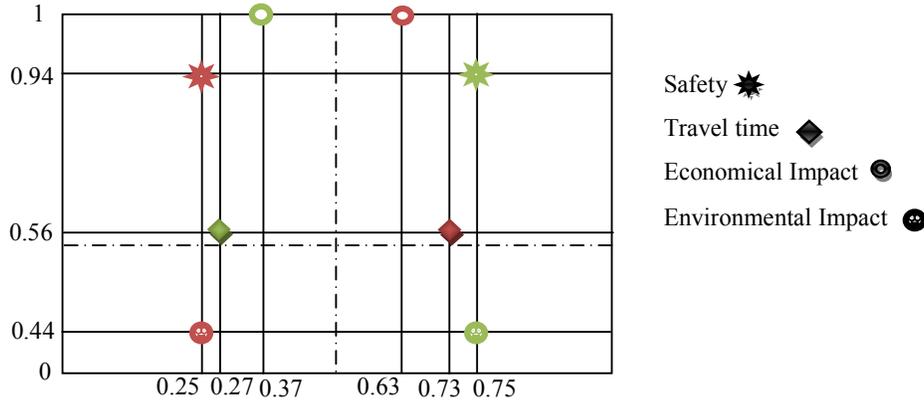
$$B_i = (1 - A_1), (1 - A_2), (1 - A_3), \dots, (1 - A_i)$$

A, B = Alternatives

E=Accountable degree

6. ANALYSIS RESULTS BY FUZZY AHP

This study used the Eq. (1), (2), (3) and (4) to find out the results of the U and L- evaluation of the alternatives for residences and governments are shown in Table. 4. By analyzing the questionnaire survey by Fuzzy AHP from residences and governments found that residences consider only rickshaw for the central part of Dhaka and governments consider banned rickshaw from main road and promote efficient public transportation will be the best solution for traffic congestion management in central Dhaka. Therefore, in this situation it's become very important to build consensus to reduce traffic congestion at central Dhaka for Dhaka city government.



Green for only rickshaw; Red for banned rickshaw

Figure 5: Alternative's evaluation by residence

7. IMPROVED THE EVALUATION FACTORS BY CONSIDERING CASE STUDY TO BUILD CONSENSUS

In this study try to find out the situation in which condition banned rickshaw and only rickshaws evaluation will be same for residence. For the above reason this study consider to improve the evaluation factors are very important for residence. From Fig.5 it is found that environmental impact and safety are more important evaluation factors for residence. So have to improve the evaluation factors economical impact and safety of banned rickshaw as minimum as possible to build consensus.

Table 5: Improvement score and U & L-evaluation score after improvement of evaluation factors by considering residence importance

	Improvement of E.F	U-evaluation	L-evaluation
Advantages	Economical Impact	0.04	0.30
Disadvantages	Safety	0.70	0.30

Table.6 Real situation after improvement of evaluation factors by considering residence importance evaluation factors

Evaluation factors are very important for residence		
	Economical Impact (TK)	Safety (Acc. No)
Improved score	0.04	0.04
Original Condition	4,389,900	5570
After	3,681,565	3160

8. GENERAL PROCEDURE TO BUILD CONSENSUS FOR PUBLIC POLICY

In general, if the alternative chooses by residence is not same with government's preferred alternative then it's very important for government to build consensus. To build consensus government have to improve his preferred alternatives evaluation factors then residence also chose government's preferred alternative. So to build consensus government can follow the following procedure:

Assume, Govt. preferred alternative = A, Residence preferred alternative = B and this study considered that consensus building will be build when on residence consideration the evaluation score of alternative “A” and alternative “B” will be equal.

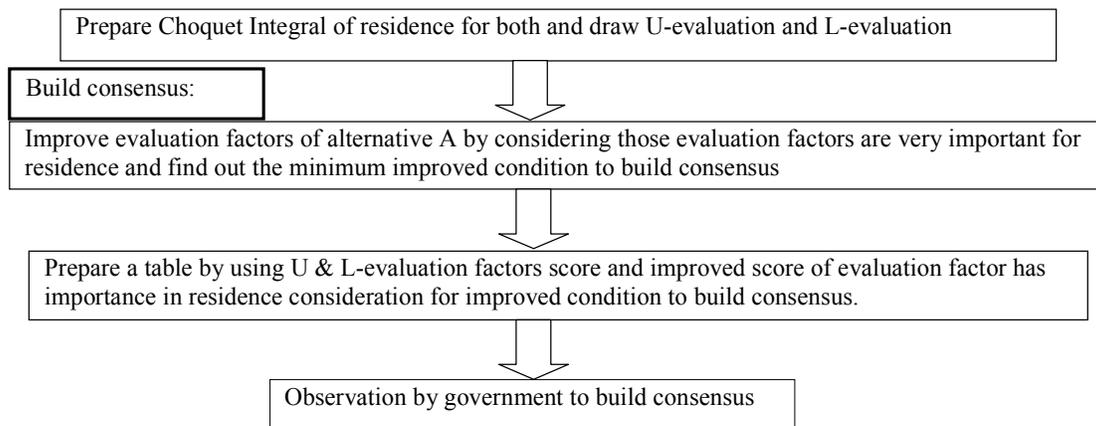


Figure 6: Generalized Procedure to build consensus for public issue by using Fuzzy AHP to improved those evaluation factors evaluation factors are very important for residence as minimum as possible

9. RESULTS AND DISCUSSIONS

To improve the evaluation factors economical impact and safety of banned rickshaw as minimum as possible found that when economical impact improve to 0.04 and safety is improve 0.04 then banned rickshaw and only rickshaws U and L-evaluation score become same. Table 5 shows the improvement score of evaluation factor and U & L-evaluation score after improvement of evaluation factors by considering disadvantages. The real condition for improvement by considering the evaluation factor has disadvantages is shown in Table 6. So by improving safety and environmental impact Dhaka city government can build consensus easily.

10. CONCLUSIONS

In this study to build consensus is considered to improve the evaluation factors that are very important for residence. In general to build consensus, it's better to improve the evaluation factors are very important for residence, then consensus building will be build and at the same time the evaluation factors will improve. By considering the case study to improve the evaluation factors are very important for residence then it will be easier for Dhaka city government to improve banned rickshaw evaluation by considering all of the evaluation factors are very important for residence as minimum as possible. Then consensus building will be build. In the same way by observing the general procedure government can build consensus for any kind of public policy.

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