

## EVALUATING THE SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT OF BATTERY OPERATED AUTO RICKSHAW IN KHULNA CITY

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### ABSTRACT

*This research stands for assessing the social, economic and environmental impacts of battery operated auto rickshaw in Khulna city. For performing that, three core issues are focused i) employment opportunity, ii) environmental hazards and iii) traffic jam and electricity consumption. In this research Khulna City is selected as study area. Because the number of battery operated auto rickshaw is increasing day by day in Khulna City. This research relied on field survey based data collection from the persons who are related to the battery operated auto rickshaw like passengers, drivers, owners etc. The findings of this study suggest that most of the people choose battery operated auto rickshaw for safety and less traveling cost. Battery operated auto rickshaw helps to improve the economic condition of driver and owner both. Another findings shows that battery operated auto rickshaw does not emit any harmful pollutants. It also creates less sound which is tolerable. But generating traffic jam, highly electricity consumption is the main negative aspects of battery operated auto rickshaw.*

**Key words:** Battery operated auto rickshaw, Employment opportunity, Electricity consumption.

### 1. INTRODUCTION

The objective of the research stands for assessing the social, economic and environmental impacts of battery operated auto rickshaw in Khulna city. Khulna is the third largest metropolitan city in Bangladesh. Battery operated auto rickshaw have been becoming more popular in Khulna city because of their low fuel cost and less human effort compared to pulled rickshaws. Battery operated auto rickshaw is the updated form of rickshaw which is locally known as easy bike. It has normally four to six seats for passenger along with the driver (Kabir, Hoque, 2015). The mode is being used as a popular transport mode especially by the lower, lower-middle and even middle income people of urban Bangladesh as the mode involves lower travel cost as well as provides much more safety and convenience to the users during travel than other public transport modes (The Daily Star, 2011). They are being widely accepted as an alternative to petrol/diesel/CNG auto rickshaws.

### 2. LITERATURE REVIEW

Comprehensive researches have been completed on battery operated auto rickshaw. These researches mainly focused on the socio-economic and environmental aspects of battery operated auto rickshaw. A recent study in Rajshahi city in Bangladesh show that the unemployment problem is reduced about 2% by battery driven auto rickshaw. It consumed about 10 kilo-watt energy at the time of per charging which creates pressure on the local electricity supply (Rahim, Hasan, 2013).

Another study was conducted in 2013 which shows that battery auto rickshaw offers low travel cost than other vehicles (Rana, Mitra, 2013). Bangladesh could save between \$200 million and \$800 million per year, about 0.7% to 3.0% of its gross national product if air pollution in the countries four major cities were reduced. In these cities around 6.5 million people suffer air pollution related diseases (Mahmood, 2011).

### 3. STUDY AREA AND METHODOLOGY

#### 3.1 Study Area

Khulna is the 3rd largest city of Bangladesh. The area of Khulna City Corporation is 14.30 square miles and divided into 31 wards. The study area was selected thus a way that it includes all classes of people.

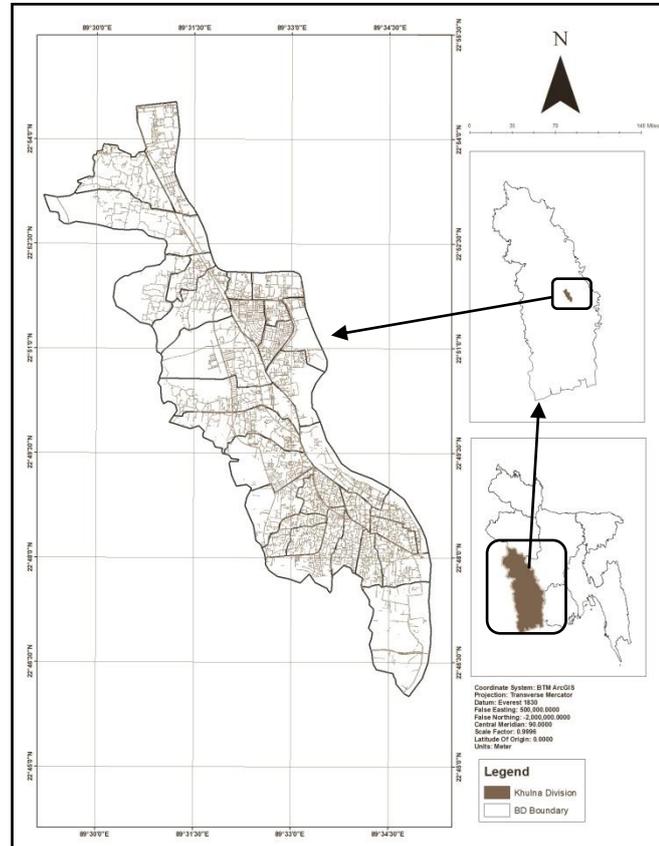


Figure 1: Map of Study Area, Source: Author 2017

Table 1: Study Area at a Glance

<b>City corporation</b>	<b>1</b>
<b>Thana</b>	<b>5</b>
<b>Ward</b>	<b>33</b>
<b>population</b>	<b>770498</b>
<b>Population density</b>	<b>18889 (per square kilometer)</b>

Source: KCC

#### 3.2 Methodology

The study was started through reading the available materials in the internet and talking to the people of Khulna city. The study area was selected to assess the social, economic and environmental impacts of battery operated auto rickshaw in Khulna city. This Study relied on field based data, which was collected through the reconnaissance survey & field survey. The preliminary survey helped to collect some initial information about the area. The field survey was done for gathering the required data for social, economic and environmental aspects of

battery operated auto rickshaw in different place of Khulna city like Fulbarigate, Daulatpur, BoyraBazar, Shibbari mor, Royal mor etc. Various types of questions were asked to the passengers, drivers, and owners who are related to the battery operated auto rickshaw of the project area. A user opinion survey was conducted among 100 persons about the fare rate, travel time, safety, travel comfort and quality of service to find out the Performance Index of battery operated auto rickshaw in the area.

The data was stored in Microsoft Excel 2013, from the data different types of analysis was done. GIS based secondary analysis help to know the overall view of the site and the exiting condition. It also helps to make maps for the study.

#### 4. ANALYSIS & INTERPRETATION

##### 4.1 Purposes of Battery Operated Auto Rickshaw

In Khulna City different types of transport mode is used like Mahindra, Bus etc. Battery operated auto rickshaw is used for working purpose, educational purpose, commercial purpose, social working purpose. Almost 53% passengers use battery operated auto rickshaw for their working purpose. Where 25% passenger use it for the educational purpose. The data was collected from Fulbarigate, Daulatpur, BoyraBazar, Shibbari mor, Royal mor.

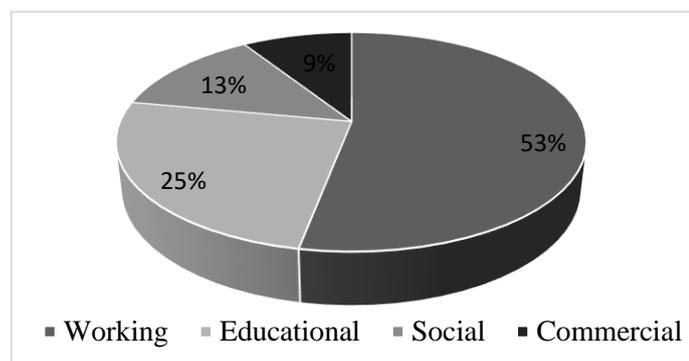


Figure 2: Purpose of Using Battery Operated Auto Rickshaw  
Source: Field Survey, 2017

##### 4.2 Positive Aspects

###### 4.2.1 Choice of Auto Rickshaw

People chose transport mode on the basis of road condition, time, availability, financial condition, distance, safety etc. In Khulna city 47% people chose battery operated auto rickshaw as transport mode. Where 42% people use mahindra as transport mode. Most of the people chose battery operated auto rickshaw because of less traveling cost, comfort and safety.

In the battery operated auto rickshaw transportation cost is less than mahindra and paddle rickshaw. In the several place the fare of battery operated auto rickshaw and mahindra issame.

Table 2: Fare of Different Mode

Mode	Distance	Fare/person
<b>Mahindra</b>	Fubarigate to Daulatpur	10 taka
<b>Auto Rickshaw</b>	Fubarigate to Daulatpur	8 taka
<b>Paddle Rickshaw</b>	Fubarigate to Daulatpur	30 taka

Source: Field Survey, 2017

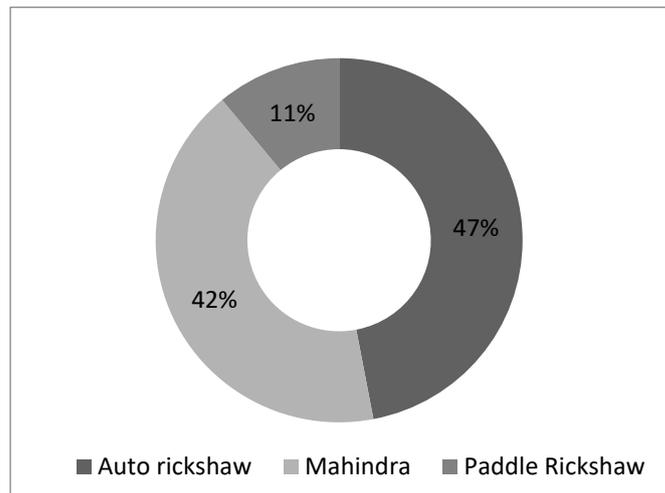


Figure 3: Choice of Auto Rickshaw  
Source: Field Survey, 2017

#### 4.2.2 Earning of the Owner

From the auto rickshaw the owner of it get 500 taka per day for each auto rickshaw from the driver. So the one auto rickshaw owner earns 15000 taka per month. Where he spend daily 70-90 taka per day which is 2100-2700 taka in a month for the maintenance and repairing. In the major repairing like replacement of battery, tire, motor the owner has to spend for the long lifecycle.

Table 3: Cost of Accessories

Accessories	Cost
<b>Batteries</b>	35000
<b>Tire</b>	1500
<b>Motor</b>	6000

Source: Field Survey, 2017

#### 4.2.3 Earning of the Driver

Most of the drivers, do not have their own auto rickshaw. They hire auto rickshaw from the owner in a daily payment basis. An auto driver earns average 1000-1200 taka per day. They have to pay 500 taka to the owner of auto daily and they have 500-700 taka in their hand. Before starting this occupation most of the drivers are unemployed and some of the drivers are engaged in other occupations like day laborer, industry worker etc. They take this profession to improve their economic condition. From the field survey it is found that 58% drivers strongly agree that this occupation change their social status, where 28% drivers are

disagree. Besides around 74% drivers say that their economic condition have been changed after taking this occupation.

#### 4.2.4 Emit Low Level Pollutants

Auto rickshaws are operated by the battery is called battery operated auto rickshaw. This auto rickshaw does not emit harmful pollutants like CO, CO<sub>2</sub> than the other transportation mode like bus, Mahindra. One of the major positive side of this battery operated auto rickshaws that, it makes low sound than other vehicles. It only produces battery water and oil pollutants, which can be controlled by proper management.

#### 4.3 Negative Aspects

##### 4.3.1 Traffic Jam

In Khulna City battery operated auto rickshaws are also responsible for the traffic jam. Because they are commonly parked beside the road. This road side parking creates traffic jam in most the important places in Khulna city.

##### 4.3.2 Electricity Consumption

The auto rickshaws need to recharge the batteries in daily. They charge these batteries from the electric supply line. It takes 7-8 hours for full charging of the batteries. Auto drivers normally charges batteries in 10 pm to 6 am.

It has been estimated that, battery operated auto rickshaw consumes approximately 300 MW electricity every day for recharging their batteries (Field Survey 2017). As Bangladesh is an electric power crisis country and this huge consumption for this purpose creates daily load shedding in the locality.

##### 4.3.3 No License

According to the field survey it is noticed that there is no license or registration number of auto rickshaw and driver. So it is impossible to find out the driver or auto rickshaw after committing any serious action. And it is also difficult to taking action against the owner and driver after committing any crime.

#### 4.4 Performance Index (PI) of Battery Operated Auto Rickshaw

In the user opinion survey respondents are asked to give their opinion on different attributes of battery operated auto rickshaw on a scale of 0 to 5. Where 5 indicates the best excellent and 0 indicate the worst performance(Rana, Mitra, 2013).

User opinions are taken about fare rate, travel time, travel comfort, safety and quality of service of battery operated auto rickshaw.

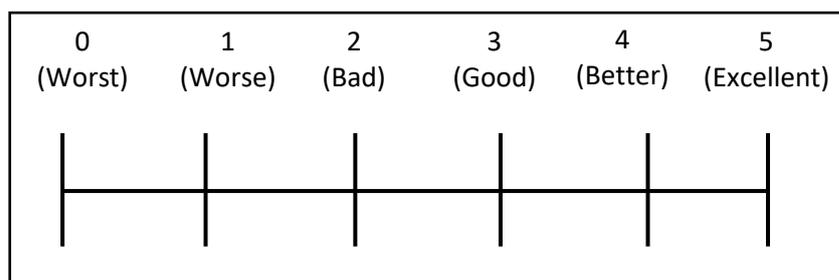


Figure 4: Scale of Satisfaction Level, Source: Author, 2017

Table 4: Value of Different Attributes

Attributes	Scale					
	0	1	2	3	4	5
Fare Rate	0	0	3	10	25	62
Travel Time	0	0	13	39	35	15
Travel Comfort	0	0	15	9	30	46
Safety	4	9	29	22	19	17
Quality of Service	0	0	6	25	47	22

Source: Field Survey, 2017

$$\text{Performance Index on Fare Rate} = \frac{0*0 + 0*1 + 3*2 + 10*3 + 25*4 + 62*5}{100}$$

$$= 4.46$$

Performance Index of other attributes of battery operated auto rickshaw

Table 5: Performance Index of Different Attributes

Attributes	Performance Index
Fare Rate	4.46
Travel Time	3.43
Travel Comfort	4.07
Safety	2.94
Quality of Service	3.85

Source:

Field Survey, 2017

From the Table 5, it is seen that the fare rate and travel comfort of battery operated auto rickshaw is nearly excellent to the users. On the other hand travel time and quality of the service from this mode is in the satisfactory level to the users. But in the safety matter, it has bad performance.

## 5. CONCLUSIONS

The analysis of socio-economic and environmental impact of battery operated auto rickshaw gives an overview of the positive and negative impacts of it in human life and environment in Khulna city. Most of the people use battery operated auto rickshaw for their working purpose, daily travel. They chose it because the fare is lower than the other transport modes. The results from the analysis represent its positive impact in the social and economic sector of dwellers of the area. By operating the auto rickshaw both the owners and drivers are economically benefited. People agree that their economic and social condition is changed after changing their occupation to it. And one of the major positive side of the battery operated auto rickshaw is that, it emits lower level of pollutants than other vehicles. But on the other hand it consumes huge amount of electricity at the time of battery charging and creates traffic jam also. By analyzing the performance index it is found that, the fare rate, travel comfort of battery operated auto rickshaw is excellent. But safety condition is not satisfactory. This study will help to improve the transportation system of Khulna city by using the battery operated auto rickshaw in an effective way and to reduce the negative aspects of it.

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