

A Silent Revolution in Rural Transportation System: A Study on Measuring the Popularity and Sustainability of 'Easy Bike' in Bangladesh

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Abstract

The Easy Bike has brought revolutionary changes in the rural transportation system in Bangladesh. This paper aims to evaluate the supply chain of the battery based electric charged vehicle popularly known as Easy Bike and identify the role of Easy Bike for the development of the country's rural transportation system. The method of data collection was both interview and questionnaire in the form of closed and open-ended questions. The researchers have selected three different stakeholders associated with the industry such as passengers, drivers and importers or Assemblers of the easy bike and developed three separate questionnaires for identifying the problems, opportunities, and the actual condition of this newly developed industry. The role played by the related authority has been identified and analyzed through extensive literature review and interview with the selected stakeholders. The collected data has been analyzed through different statistical tools. Research findings show that the vehicle has become the most reliable and one of the fastest mediums of the transportation system for the rural people as well as urban people. The reasons behind the popularity of the vehicle are reduced fare, safe to travel, environment-friendly, faster than the previous transport mode and easy to operate the vehicle. The availability of the auto rickshaw in the current time has reduced the mortality rate in case of different emergency need for Medicare services. This vehicle is also making the contribution to girls' secondary higher education by easing their movement to the remote area where most of the colleges are situated. There are problems like higher electricity cost, poor road structure, illegal extortion, lack of driving training facility etc. faced by the industry. The removal of these problems will accelerate the growth of the industry and will ensure long-term benefits for the industry.

Keywords: CNG, Easy Bike, employment generation, rural transportation, urban transportation

1. Introduction

Transportation is the backbone of a country's economy and it is the medium of creating the utility of goods and services in the rural and urban area which helps the country for balanced development in all sectors. The transportation of the rural area of Bangladesh works as a bridge between rural and city area. Though transportation systems are crucial for the development of the country, Bangladesh was a failure in developing a strong rural communication channel and this was one of the major problems for not being successful in ensuring the balanced growth in the past years (Mitra and Saphores, 2016).

The transportation system is the pre-condition for the balanced development of all area of a country while Bangladesh is lag behind in developing the infrastructural and other necessary development of the transportation system. The city area of Bangladesh is dependent on the contribution of the rural area for the supply of necessary agricultural goods but the communication system for transportation of necessary goods is very poor compared to the requirement (Deakin et al., 2004).

The rural area of the country was linked with some old form vehicle like paddle based rickshaw or van, Nossimon, Korimon or similar type of traditional vehicles that were moved with the help of manpower and analogue type of engines and this took a long time for movement and high cost for any kind of transportation. The traditional transportation mode of the rural area is one of the main reasons for not ensuring the development

according to the plan of the central authority. The gap for development has widened between the rural and urban area for the lacking in developing a perfect transportation system (Jeon et al., 2016). Although the Upazila or district cities are connected through large or medium vehicle run by using the different fuels like natural gas, diesel, or others petroleum, the gap between district or Upazila city and rural area were mainly dependent on that kind of traditional vehicles. The communication between the capital and the divisional cities is conducted by a large vehicle like bus, truck, train but all the vehicles are not standard for transportation service. In the recent year, Bangladesh is experiencing a silent revolution in the rural transportation system by replacing the previous traditional mode of transportation system through a new mode of transportation “Easy Bike” which is a battery based three-wheeler vehicle that can carry maximum 6 passengers at a time and comparatively faster than the previous mode twice and less costly (Hu et al., 2017).

The “Easy Bike” has brought a revolutionary change in the rural communication system in Bangladesh. This research aims to see the impact of the vehicle on the employment generation and changes brought in the transportation and communication system. Finally, the environmental consequences of the vehicle have been evaluated. The vehicle has been recognized through many types of research as one of the most important elements to the rural transportation system and it has been established as a growing industry for the rural transportation system in Bangladesh (Mahmud, 2004).

Since the maximum materials of the vehicle are brought from China, it needs to depend on the imported material for the final assembling until the final development. With considering the aspect, the industry can be called as the import based and the recent development of some parts in the domestic area has reduced the dependency and the production of the products in the home country is a positive issue for the country as well. The development and production of the required materials are creating the environment for making the industry independent and home country based (Wang, Xue, & Liang, 2012).

The development of the product and organizational facility has created the opportunity for exporting the vehicle in India and the Middle East (Hizaamu, 2015). The industry has the chances for building own firm and creating the opportunity in the different market around the world. From the long term experiences and development of the expert human resources, this industry can be an effective source for the export of the vehicle. Since the technology and materials are being available in the area, the country can take the chances as the first mover in the electric vehicle producers like Easy Bike (Plötz, Gnann, & Sprei, 2016).

The vehicle (Easy Bike) is built with materials like iron, still, acid, plastic, light, reksin, tyre and other related materials. The supply of the required materials is not available in a specific country and the producer country need to depend on the other foreign country for the import of the required materials and this is being influenced by the regional trade and agreement. Since the process is interdependent, the impact of the process cannot be ignored (Craft, 2001). The vehicle moved through the support of electricity. For the production of the electricity, it needs to buy the fuel from the other country and the regional block can be the indirect influential issue on the industry. So, the regional impact on the industry cannot be ignored and the fluctuation of suppliers is also possible but not in the short term period for the energy sector (Arefin & Mallik 2018).

The vehicle “Easy Bike” introduced in Bangladesh at first by 2004 in Cumilla through importing the vehicle and necessary parts but the vehicles became popular by 2008. The vehicle spread over the country especially in the rural area as an easy way of transportation. The significance of the study is that the study will help the reader to get a clear view of the rural transportation system and the contribution of the “Easy Bike”. The reader will get a clear idea about the value chain of the vehicle that has built a new industry (Choudhury, 2017). Through the study, we will get the necessary recommendations for building the industry as a separate segment of the transportation system in Bangladesh.

The vehicle is designed with three or four wheels with a motor and control box where electricity is the main fuel for running and a battery is used for storing the electric charge. The other materials like plastic, reksin, rubber etc. are used to make the vehicle. The vehicle is easily moveable in any kind of road and needs a small space to move. It is comparatively lighter than other vehicles and anyone can drive it by taking simple training. Through the installation of the motor, control box and battery in the domestic rickshaw or van in the existing design, people are using the Easy Bike. The vehicle has reduced the distance for the rural people as well as for the city people (Xiong et al., 2012).

The views of the three selected stakeholders about the sector have been evaluated by developing a separate questionnaire for each of them and the results have been analyzed according to the standards and objectives. The first stakeholder is the passenger who is using the vehicle for transportation purpose. The passenger segment has been analyzed by focusing on the cost, time, safety, and usefulness of the vehicle for using in different purpose.

The second stakeholder is drivers and the segment has been analyzed by focusing on the durability, income generation, problems and challenges, and the probable suggestions for the development of the sector. The last stakeholder is importers or assemblers and this segment has been discussed on the basis of the further opportunity and the growth factor of the industry, the problems and challenges they face and recommendations to recover the condition. The report has been prepared to show the chain and the future benefits of recognizing the vehicle industry as a promising sector in Bangladesh.

The rural transportation system in Bangladesh has changed the ratios of women's participation in higher education. Most of the colleges are situated at the Upazila levels which are far from most of the villagers. Girls from the rural area usually feel demotivated for higher education as they don't have an available mode of transportation to attend remote colleges (Arora, 2016). Currently, the situation has been changed a bit due to the introduction of Easy Bike. Now, girls are using Easy Bike to attend remote colleges. The easy bike is playing as the catalyst for the women education development in the rural area of Bangladesh (Griffioen, Doppenberg and Oostdam, 2017).

The research has been designed to make a clear overview of the Easy Bike in Bangladesh where the previous journals and articles have been published about the use of the vehicle on the specific city of the country by mentioning only some specific factors like a traffic jam, electricity use, and comparative discussion about fuel consumption etc. But this paper has been prepared by considering the overall factors of the vehicle and identifying the chain of the industry.

The report has prepared on an objective basis where the objectives have been designed to get the actual overview and current condition of the vehicle in the country. The objectives of the research paper are: (1) to outline the supply chain of "Easy Bike" and to identify different stakeholders associated with the industry; (2) to identify the role of "Easy Bike" in the urban and rural transportation system; (3) to evaluate the impact of the vehicles (Easy Bikes) on the environment and sustainable development; (4) to evaluate the role of "Easy Bike" on income and employment generation; (5) to identify the facilities provided by the Government and related authority to the segment; (6) to identify the problems faced by stakeholders of "Easy Bike" and to forward some policy suggestions.

2. Literature Review

The transportation means carrying of people or materials from one place to another place via any medium like road, rail, and water or airway for a specific amount of fee. Transportation creates the local utility of the products through the movement of the products. The more strong transportation system a country has, the more stability exists in the economy of the country. The transportation for the country works as the connector of the city and rural area. Development of transportation system is considered as one of the highest priority sectors for the country's development and Bangladesh is developing in this sector day by day (Chung and Ahn, 2002).

Since independence, Bangladesh is developing the transportation system by constructing the infrastructural development for ensuring a better transportation system. The widely used and easy mode of the transportation system is road-based transportation system and Bangladesh is suffering since the initial period in linking the rural and city area via any developed medium for transportation. Earlier, the transportation system of the rural area of Bangladesh was dependent on the human paddling based three-wheeler like rickshaws and van (Liu, Yan and Wang, 2017).

In the 90's decade, Bangladesh installed CNG auto for the local transportation and city area by replacing the two-stroke three-wheeler but the modes were available only for some specific area. The gap between rural and city area was unchanged and the lacking of installing proper transportation mode impacted on the GDP where the rural area is considered as the supply hub of all kinds of agricultural products and raw materials of the industry (Gregório et al., 2016). Bangladesh is one of the fastest developing countries in the world through a decade. The country is experiencing a continuous growth of GDP more than 6% for the last decade time. The per-capita income of the people is about \$1751 and the country has a reserve of foreign currency about US\$31,056 million (BB, 2017).

The vehicles were brought in Bangladesh by 2004 in Cumilla and the commercialization of the vehicles started in 2008 throughout the country. Besides the rural area, the maximum cities in the country except the capital are also depending on the vehicles for short distance movement because of its low cost and high-speed nature. The benefits associated with the vehicles have made an attraction to the users and other stakeholders (Nur, 2017).

The "Easy Bike" is the separate mode of the transportation system in Bangladesh. The vehicle has been introduced at first in the city area of the different cities in Bangladesh but after some years, the vehicle becomes

popular all over the country from the city area to rural area. Some of the reasons behind the popularity of the vehicles are a quick response from the stakeholders, useful in a wide range of movement, the available supply of electricity, simple to operate and easy to maintain (Crețan and Matthews, 2015).

The Easy bike is built by using some small chassis and three wheels. The chassis is made from mild steel and the body with GI pipes. The shape of the vehicles is slightly aerodynamic and the overall dimensions 287*105*178 cm which depends on the design of the manufacturers. The vehicles can be used for transporting 6 passengers at a time. A waterproof dc motor, powered by lead-acid batteries is used as the sources of power (Rana et al., 2013). According to the recent information from BPDB, about 5, 00,000 battery operated three wheelers are moving around the city and rural area which consumes 450MW electricity per day approximately. After a four-hour recharge from a regular power station at homes or commercial charging station, the vehicles can run up to 120 km. The speed is 60 km per hour. The vehicle runs with the support of an automatic gearbox (PDB for bringing battery-run vehicles under tariff regulations, 2019).

An electric three-wheeler with four rechargeable batteries cost Tk 1.4 lakh while ones with three batteries cost Tk 1.25 lakh. More than 150 assemblers are locally assembling the three-wheelers by importing the parts from China. Drivers of the vehicles said that the three-wheelers would consume electricity worth around Tk 20 in a day. However, they charge passengers nearly half times less fare than the human-paddled based rickshaws. There is no legality of these vehicles running on the road because it doesn't fall into any category of vehicles according to the motor vehicle ordinance 1983 (Parveen, 2019). In considering the factor power consumption, the authority has proposed a tariff imposition on the charging of Easy Bike and the BRTC technical evaluation committee backed the proposal, which sets a distinct price figure for battery-operated vehicles of Tk 7.25 against the consumption of per unit electricity. The service charge was proposed at Tk 25 for a one-phase line and Tk 40 for a three-phase line (PDB for bringing battery-run vehicles under tariff regulations, 2019).

Electricity is the source of power of the vehicles Easy Bike; on the other hand, the sources of power of 4 strokes three-wheelers like CNG auto, Nosimon, Korimon, are petroleum and natural gas which emit carbon dioxide and cause sound pollution in the area. The other vehicle cost is double than the "Easy Bike" and creates a negative impact on the environment (Webster, 1999). With the low price and less risk and high speed, the mode has become the part and parcel of the daily life around the country like a silent revolution in the rural transportation system by replacing the old mode of the transportation system. The supply chain of the country's agricultural goods and raw materials of the different industry has become stable through the vehicles. In the outside of the Dhaka city, the maximum district and divisional cities have the presence of Easy Bike (Verdier, 2013).

There is an opportunity of using solar energy in the "Easy Bike" by installing the solar system and this can be effective for reducing electricity consumption from the national grid. There is a proposal about solar installation with the designs and technical assistance which will support for developing the vehicles by Brac University. The people will be able to operate where the supply of electricity is not available. Bangladesh government is implementing the plan by installing the system and it is establishing some solar charging stations as a pilot project in Keranigonj and other different areas on a trial basis (Energy Bangla, 2019).

The different reports show that the vehicles are hampering the national electricity grid and creating a traffic jam in the city area. There is also debate that the vehicles fall in accident frequently. There is no legal permission for running in a high way and legal license to the drivers for driving the vehicle. The vehicles move in the high way that hampers the speed and movement of long distance moving vehicles, according to the experts. The harassment of the authority of BRTC and Highway police authority is very common for illegal extortion. In the recent year, the producers have brought some changes in the design of the vehicle and this new design has reduced the accident rate (Hsu and Jones, 2017).

The different reports and journal had been prepared on the "Easy Bike" about the positive and negative impacts compare with others vehicles like CNG auto in the specific area like Khulna, Sylhet, and Rajshahi through both quantitative and qualitative research but there is some information gap about the vehicle. The main focus of the report is to see the changes brought by this transportation mode throughout the country (Arman, Arefin and Mallik, 2018).

The environmental sustainability is the process of managing the changes in a balanced way which meet the demand and requirement of exploitation of the natural resources and technological development with a harmonious way and ensure the current and future aspiration of the related stakeholders. The environmental sustainability contributes for the infinite period which makes the system more effective to the aspect and the justification of the sector remain in both current and future in the related area (Patil, Wei, Pullar & Shulmeister, 2018).

The medical services in the rural area are not available and the people need to come in the urban area for getting the services. In the past, communication from the rural area to the urban area for the emergency medical treatment was based on the paddle based rickshaw and van. But the availability of the auto rickshaw in the current time has reduced the mortality rate in case of different emergency need for Medicare services (Sanko and Eckstein, 2015).

The Easy Bike is one of the most sustainable modes of transportation as the vehicle is run by the support of electricity. It has no environmental pollution as it does not produce any kind of smog or sound like the other vehicles. The vehicle can be designed with the use of the solar energy system which will ensure the less consumption of the mineral fuel. As the power of the sun is unlimited, there will be no shortage of energy to run the vehicle.

3. Methodology

The report entitled to ‘A silent revolution in rural transportation system: A study on measuring the popularity and sustainability of ‘Easy Bike’ in Bangladesh” has been prepared by setting some specific objectives. The first objective is to identify the supply chain of “Easy Bike” and to identify different stakeholders associated with the industry. An extensive literature review has been conducted to understand the parties associated with the industry and also identified parties have been asked to understand who the related stakeholders of the industry are. The second objective has been set for identifying the role of ‘Easy Bike’ in the rural and urban area who is the beneficiary of the vehicle like passengers and drivers in different area. Literature review along with a questionnaire has been used to fulfil this objective. The third objective is to identify the impact of ‘Easy Bike’ on the environment and sustainable development. To get the actual results, the separate questionnaires have been prepared for the associated stakeholders and literature review has been conducted to see the previous scenario. The fourth objective has been set for identifying the role of ‘Easy Bike’ on income and employment generation. The data has been collected through a direct interview for fulfilling the fourth objective to the related drivers who are driving the vehicle in a different area of Bangladesh. The fifth objective is to identify the facilities provided by the government and related authority for developing the sector. To get the results, survey questionnaires have been used for all related stakeholders like assemblers and importers, drivers and passengers. The sixth objective has been set for identifying the problems of the sector and the policy suggestions from the stakeholders. To get the required information about the objective, the survey questionnaire has been used.

This is exploratory research since the research has been conducted to get a clear overview from different aspects of the ‘Easy Bike’. Although some research articles have been prepared by covering only a few areas and the specific feature of the vehicle, it has become possible for evaluating the actual conditions of the sector through using the explorative research design (Mallik & Arefin, 2018).

The random sampling techniques have been applied to the 3 targeted populations (Importers/assemblers, drivers, and passengers). The respondents of each stakeholder have been selected by maintaining the gender and age criteria based. The total sample size is 850 respondents where 400 respondents are the passengers and 400 are drivers and 50 respondents are assemblers and importers.

In considering the segment of the transportation industry, the scope of the research has been divided into three groups and they are the importers or assemblers, the drivers and the passengers. The data has been collected from 50 individuals importers and assembling organization for evaluating the chain of the industry through production to the users of the vehicle. There is about 150 organization involves importing and assembling the vehicles from China and India (Ali, 2019).

In considering the development of the sector and accomplishing the set objectives, the data has been collected from 4 (four) Upazila of 4 (four) different districts in Bangladesh. For the secondary data, the review has been done on the article already published in the previous time on ‘Easy Bike’ and the required citation has been given according to the sources. Data has been collected through the questionnaire. As already mentioned, three different questionnaires have been developed on three stakeholders associated with the Easy Bike industry.

The research questions have been developed on the basis of some parameters and variables. The variables and parameters help to know the scope of the industry, development of domestic suppliers, developing of the expertise to the domestic employee, development of employment opportunity for the industry, problems and opportunity, contribution in the driver’s income level, contribution for employment opportunity of the rural area, facilities for the passengers in the context of time and cost reduction and contribution of the government (Uche, 2016).

Most of the data were qualitative in nature. Data analysis techniques like average, percentage, summation and

some other descriptive statistics tools have been used for analyzing the data. MS Excel has been used for data analysis. Different graphs and charts have been used through the excel software for visualizing the results more clearly. The Likert scale has been used for some questions with a direct interview from the selected area. Likert scale 1 to 5 has been used to measure choices of the respondents on different issues.

In this paper, the related stakeholders have been identified and the contribution of the vehicle for all the stakeholders has been derived. The related problems and opportunities also have been discussed but the range of changing effect on the different level and the comparison with others mode and fuel consumption has not been discussed and analyzed for the sake of time and cost.

4. Discussion

The researchers have collected the required information by the combination of literature review, survey questionnaire and direct interview. The discussion for each objective has been prepared by analyzing information collected from the above mentioned three sources. The researchers have intentionally avoided presenting the survey outcome for each question as researchers do not want to confuse the reader by providing too much information. If any reader wants to know the survey result along with the survey questionnaire, the researchers would love to share. In the below, all the information have been presented as per objective. So, that reader might understand whether the objective is fulfilled or not.

Objective 1: To outline the supply chain of “Easy Bike” and to identify different stakeholders associated with the industry.

Through the survey, it has found that the chain consists of 5 (five) levels from the producers to consumers. The maximum parts of the vehicle are produced in a foreign country and some are produced domestically. The related parties are producers, importers, wholesalers/dealers, drivers and passengers. The chain has interconnection with related stakeholders who are conducting the business by the partnership or individually. The importers supply the required parts along with the vehicles.

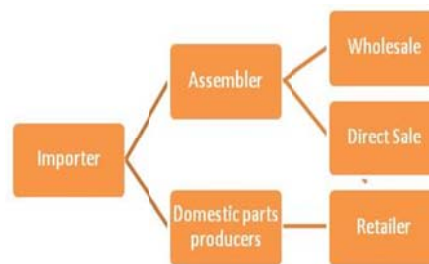


Figure 1. The value chain of assembler/producers in Bangladesh

Sources: Survey result.

The only supplier of the vehicle is China and 88% of respondents from 50 importers/assemblers said that some parts are being produced domestically like seat, body, chassis, and battery at present. The industry is growing as the backward linkage for the sector. The raw materials like steel, plastic and reksin are being used for the production of the parts of the vehicle. The production and supply of the raw materials are growing as a subsidiary industry in the country.

According to the respondents, the sector is flourishing through the years from the opening period as they are involved with the business about 7.5 years and the growth rate of the organization is currently above 5.012% annually on average. The growth rate has less fluctuation over the years and it is moving upward with a balanced flow. The organizations which are involved in this sector have been able to create an employment opportunity for 11 people for every assemblers or importer business organization.

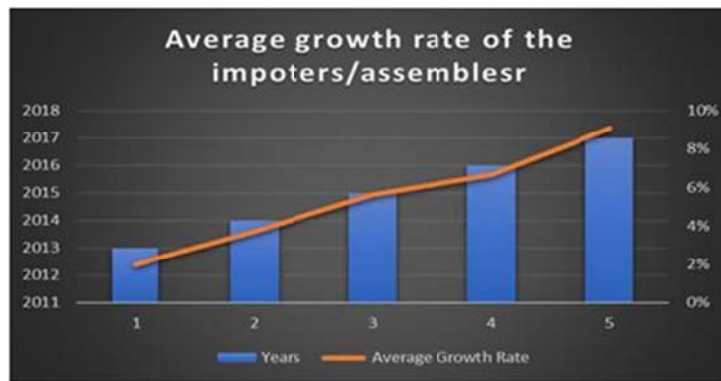


Figure 2. The growth rate of the assemblers

Sources: Survey result.

The growth rate of the surveyed organizations from 2011 to 2017 has shown in the graph. It indicates that the growth rate of the organization is upwards and it is increasing day by day compared to the previous years. The positive growth rate indicates the developing position of the sector on a continuous basis to the upward trend. The supply chain of the required materials has been developed in the easy way and the drivers or related parties get the required materials at hand when they need. The survey indicates the supply chain of the vehicle is stable since there is a good business relationship with China and Bangladesh. In recent years, Bangladesh and China are producing the parts jointly in Bangladesh.

The assemblers or importers face the challenges like an excess tariff, less efficient technician, legal problems and harassment from the administrative authority. The government has imposed altogether 92% tariff on the products and some organization are producing less qualified parts and there is no legal permission for producing the parts. So the users claim that the sustainability of the products is very poor. In considering the opportunity of developing the industry, the main problems are the lack of technical knowledge and lack of the available technology to make the vehicle more flexible and sustainable.

The support for industry development is required from both the public and private sectors. As one of the most promising sectors for the economy of Bangladesh, the opportunity of developing the backward linkage for the balanced supply and demand of the vehicle is necessary. There are some chances for the development of human resources in the sector with technical knowledge, experiences and managerial knowledge about conducting activities. Available manpower and resources in Bangladesh are the best alternative way for developing the sector and this will be helpful for the reduction of the unemployment rate in the country. Likert scale 1 to 5 has been used to understand the level of each challenge. Likert scale 1 is for the lowest level challenge and 5 are for the highest level challenge.

Table 1. Challenges faced by the easy bike assemblers/ importers

Statements	Respondents	Mean	Median	Mode
High Import Tax	50	5.00	5.00	5
High Competition	50	3.90	4.00	4
Difficulties created by transport authority	50	3.60	4.00	4
Lack of Technical support	50	3.34	3.00	3
Supply of required materials	50	3.40	3.00	3

Source: Survey Result.

The backward linkage industries may flourish on plastic seat production, development of the steel production, development of the battery production, development of the maintenance and servicing sector and spare parts of the vehicle. The producers of those products are the direct partners of the sector and they are the indirect suppliers and consumers of the products for the vehicle. The different stakeholders of the sector have deep influences on the sector and the involvement of the different stakeholders is contributing to developing the sector.

Although some parts are being produced domestically in recent time, the chain of the industry has started by importing since the industry is 100% import oriented. The importers bring the spare parts and assembler or some separate organization assembles through purchasing from the importers. The assemblers sell the vehicle on a wholesale basis. Some small organizations sell the vehicle in different district area without any direct contact with the importers. The supply of the different parts and accessories are being conducted by the retailers. The retail seller of the spare parts and the accessories are also connected to the chain and the process has created a new platform in the employment sector.

Objective 2: To identify the role of “Easy Bike” in the urban and rural transportation system.

Easy Bike has brought the revolutionary changes in the rural transport system according to the survey conducted on the four Upazila (Lohagara of Chattagram district, Shamnagar of Shatkhira district, Atghoriah of Pabna district, Atoray of Panchagarh district). The vehicle has two forms: (1) Popularly known Easy Bike or Auto; (2) The Bangla auto (Installing the motor and other parts on domestic Rickshaw and van). People use both forms of vehicle for transportation in the rural area.

From the survey results, about 99% of users (Total respondents = 400) like to ride on Easy Bike and 94% of passengers think it is safe for moving. Around 92% of respondents use the vehicle for short distance movement and 6% use the vehicle for long distance like 10 to 15 kilometers and 2% of people use the vehicle for both purposes. The results indicate that the vehicle has reduced the cost and distances of rural people by installing the quickest medium of transportation which is widely used for the short distance.

Of the 400 respondents, 100% of respondents said on average, it took 31.93 minutes to reach a specific destination by the previous transportation medium where currently it takes only 15.10 minutes for the same destination. The time consumption has reduced by half and the vehicle is considering the best transportation system for the rural people in Bangladesh.

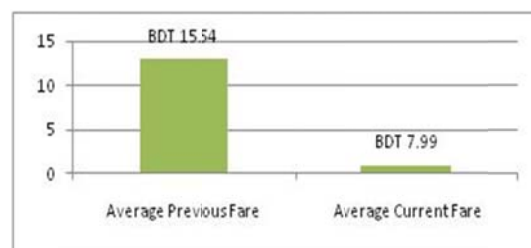


Figure 3. The comparison of fare by the passengers paid in different movement

Sources: Survey results.

The Easy Bike has reduced the cost by half from the previous mode according to the 100% of respondents. Earlier, it required paying for Tk. 15.54 for a specific destination and currently it takes Tk. 7.99 for the same destination at the shortest time. Travelling by Easy Bike is easy and comfortable. 94% of respondents said that it is safe for travelling and 6% think it depends on the driver's experiences.

The vehicle can move on any kind of road like pave or muddy road and it needs a very small space to move. 74% of users said that the current design of the vehicle is perfect and 26% of respondents said that it needs to improve the design. It needs to increase more space as it feels congested. It causes an accident for being overloading passengers. 85% of the respondent does not support for running the vehicle on the high way for causing accidents where 15% of respondents said it should drive on the high way as it can move easily and can transfer more passengers within a short time.

According to 92% of respondents, the vehicle has reduced the time consumption for passengers. Maximum users use the vehicle for a short distance. 9% of respondents said that they use the Easy Bike for goods transportation and it is costly and 80% user among 400 respondents said that they use the Bangla auto for goods transportation and it is less costly and faster than the previous medium and 11% of respondents agree that the cost is same and moderate for the goods transportation. The farmers are the largest beneficiaries from Easy Bike as they can transfer the agricultural products in the market with lower cost. Likert scale 1 to 5 has been used. Liker scale 1 for strongly disagrees with the statement and 5 for strongly agree with the statement.

Table 2. Reason for choosing easy bike over other modes of transportation

Statements	Respondents	Mean	Median	Mode
Less time required to reach the destination	400	4.91	5.00	5
Less costly mode of transportation	400	4.85	5.00	5
Safe to travel by Easy Bike	400	4.61	5.00	5
Environment-friendly vehicle	400	4.86	5.00	5

Source: Survey Result.

Objective 3: To evaluate the impact of the vehicles (Easy Bikes) on the environment and sustainable development.

The impact of the vehicle on the environment and the sustainable development of the Easy Bike in Bangladesh can be described by considering different dimensions. The vehicle has the deepest impact on sustainable development as the feature of Easy Bike is different from the existing vehicles. The term sustainable development indicates the use of existing resources with economic development and creation of employment opportunity through less environmental pollution and without depletion of the natural resources (Campion & Essel, 2013)

The Easy Bike is helping for the economic development of the country through the creation of employment opportunity and it has a less harmful effect on the environment and it ensures less depletion of the natural resources compare to other modes as the vehicle run with the use of electricity and cause less pollution both air pollution and sound pollution.

The vehicle runs by electricity and the parts are designed by using reksin, plastic, steel and other environment-friendly materials that have a less negative environmental effect. According to 100% of respondents, the vehicle does not cause any kind of damage to the road. It does not cause any kind of pollution as well as it does not emit fog like others vehicle. The average durability of the products being used is 48 days and the most vulnerable parts of the vehicle are a battery, motor and control box.

A fuel-based vehicle uses fuel as a source of energy and the use of fuel energy is the leading factor in the depletion of natural resources. More specifically crude oil is the main factor of the existing vehicle’s energy that is used through refining. The existing vehicle is not contributing to the sustainable development and causing harm to the environment. Although electricity is being produced by using oil or gas, it does not cause environmental pollution like the current vehicle. So, Easy Bike can be the best option for sustainable development in the urban and rural area. The maintenance of the vehicle is very easy and servicing opportunity has grown in a different city to union level market and it is creating the employment opportunity for people in the country. The required parts are available and 100% parts of the vehicle are recyclable that has zero negative effect on the environment as it does not emit carbon-dioxide like other modes.

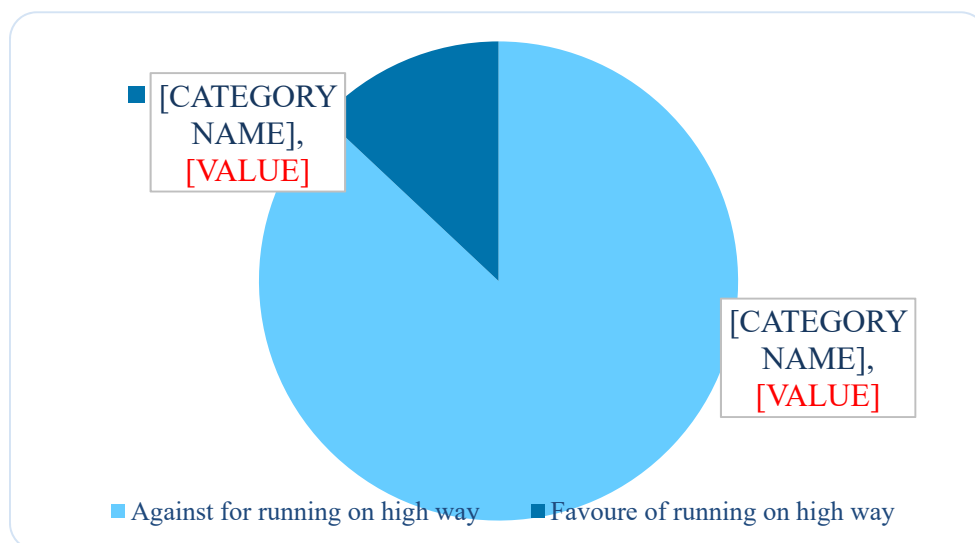


Figure 4. Passengers perception of running the vehicle on a highway

Sources: Survey result.

According to the 100% of respondents, the vehicle is solar transferable but the current road structure is not appropriate for running the vehicle. 87% of respondents said that driving the vehicle in a high way is risky. 13% of respondents said that there is more opportunity for earnings by driving on the high way.

100% of the respondents said that the parts of the vehicle do not cause any kind of pollution in the environment. The vehicle does not create any sound pollution while running. The production of the parts of the vehicle may cause some pollution but the proper measure can reduce pollution. There is no color or smell of electricity where the other's vehicle uses the fuel for moving the vehicle cause bad smell and other pollution in the area. The parts used in the Easy Bike completely environment-friendly. Production of the parts of the vehicle or assembling the vehicle cause different types of pollution. Likert scale 1 to 5 used to capture passengers perception of pollution created by Easy Bike. If a passenger is strongly agreed with the statement, he provided 5 or if a passenger is strongly disagreed with the statement provided 1 or he chose the value between 1 to 5.

Table 3. Passengers perception of pollution created by the Easy Bike

Statements	Respondents	Mean	Median	Mode
Air pollution	400	1.00	1.00	1
Sound pollution	400	1.22	1.00	1
Water pollution	400	1.08	1.00	1
Others pollution	400	1.38	1.00	1

Sources: Survey result.

Objective 4: To evaluate the role of “Easy Bike” on income and employment generation.

The easy bike has created an employment opportunity for 12% of unemployed people among 400 respondents. Earlier, maximum respondents were paddle based rickshaw puller. According to the 100% of respondents, an Easy Bike driver earns Tk. 739.58 per day by driving the vehicle after charging one time. The income is higher on average by Tk. 280.11 compared to the previous per day income. The drivers are driving the vehicle for 26.62 months on average and the financial condition of the respondents are better than the previous time and their standard of living has been upgraded.

A person can buy an Easy Bike by investing on average Tk. 141 891 and it is affordable for the stakeholder. The passengers use the vehicle frequently for the lowest cost and it can go on average 137.60 kilometres by charging one time. The people can charge battery commercially where the personal electric connection is not available. Another opportunity for the users is that the paddle based rickshaw puller can install the auto system in the domestically produced rickshaw or van by investing on average Tk. 45 000.

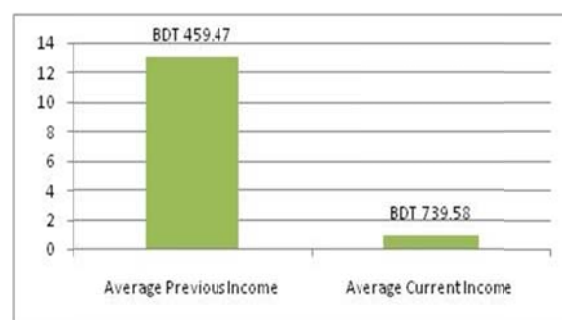


Figure 5. Comparison of current Income with previous income

Sources: Survey result.

The monthly electricity cost on average Tk. 350 for the Bangla auto where the Easy Bike consumes the electricity cost in amount Tk. 2509 monthly.

The vehicle is contributing in both rural and urban area of maximum divisional and district cities as a good medium of transportation. The vehicle can be used for both goods and passenger's transportation. Both the drivers of the vehicle and the passengers are getting the benefits of having Easy Bike. The drivers of the vehicle

are supporting on average 7 persons in the family and they are contributing for the development the family's status, lifestyle, life standard and educational knowledge for the future workforce of the country. For the higher income opportunity, the reduction of poverty has become possible for the lowest income level people in the country. The vehicle is contributing to the economic and social development of the country.

Objective 5: To identify the facilities provided by the Government and related authority to the segment.

Easy Bike or Auto Bike in Bangladesh has occupied the transportation system by replacing the former paddle based rickshaw or van, especially for the rural area. The vehicle is running in the whole country about one decade although it was not available at the beginning, it has now spread over the whole country. The vehicle was previously 100% import oriented and in recent time, some domestic organizations are producing some parts but still, they are dependent on the imported parts.

In considering the factors, the government has a deep role in developing the Easy Bike industry and the associated stakeholders for running the vehicles in the area. But the support from the related authority is zero per cent according to 100% of respondents. Instead of getting support from the authority, the drivers and the importers/assemblers face the different problems in their own area. The drivers need to collect the registration from municipality or union on average Tk. 8500 as a registration fee at the initial stage and they need to renew it every year by Tk. 4000 per year.

The drivers need to pay on average Tk. 400 for the owners association which distributes the money among the different political parties and police station. The vehicle is not allowed to ride in the high way and this is logical for banning the vehicle on the high way. But the police station and the related authority with political leaders are taking the money illegally and giving permission for riding on the high way and so the accident is occurring frequently in a high way.

According to the respondents, political leaders of both rural and urban area collect on average Tk. 55 every day from every driver and they are collecting the money without the liaison of government and so the government is losing a large amount of tax every year. The drivers are forced to pay the money otherwise they take away the vehicle as the administrative authority has the liaison with them. The importers said that they need to pay altogether 92% tariff for importing the required parts and materials. There is no fixed policy and rules regulation for the sector.

Objectives 6: To identify the problems faced by stakeholders of "Easy Bike" and to forward some policy suggestions.

The scope of the battery based vehicle has extended all over the country and it has turned as one of the important media for the different purpose of the transportation system. The acceptance of the vehicle has spread all level of users throughout the whole country. The stakeholders face different problems daily as there is no legal permission and regulatory authority for operating the vehicle. The sector is affected by the different problems which de-motivate the stakeholders for developing or extending the sector which is affecting the economy negatively. The importers/assemblers face the higher tariff rate from the government and the drivers of the vehicle are forced to pay on average Tk. 55 as association's fee which is collected illegally by the different political party from per driver every day. The high way authority sometimes takes away the vehicle for driving the vehicle in a highway.

Another problem is the durability of the materials used in the vehicle. The average durability of the parts is only 48 days which cause the problems for drivers as they need to replace the parts regularly and this decrease the income level. According to 66% of respondents, the most vulnerable parts are controlled box and motor and the rest 34% of respondents said that the vulnerable parts are battery although the sellers of the battery provide a warranty of 6 months. The supply of electricity and the inefficiency of the drivers often cause the problem for both drivers and passengers. The higher electricity price is also a problem for the driver and the user of the vehicle. The design of the vehicle cause some accident for unawareness and the drivers do not have enough experiences in driving the vehicle. A list of suggestions has been derived by interviewing the respondents. The derived list has been provided to the importer for rating purpose. If an assembler or importer is strongly agreed with the statement, he/she provided 5 or if an assembler or importer is strongly disagreed with the statement, he/she provided 1 or he/she chose a value in between 1 to 5.

Table 4. Suggestions that might help the industry to grow more

Statements	Respondents	Mean
Increasing registration facility	50	4.78
Reduction of tariff	50	4.86
Stopping police harassment	50	5.00
Reduction of extortion from the local authority	50	4.80
Establishment of the technical training centre	50	4.45
Reducing the electricity price and establishing commercial charging plant	50	4.90
Supporting for driving license	50	4.46
Providing assistance for installing the solar system in the vehicle	50	4.65
Developing and constructing the road as it needs the good paving road	50	4.67
Setting rules and regulations for controlling and monitoring the sector	50	4.70

Source: Survey Result.

5. Conclusion

The contribution of the transportation system is very much high for the economic welfare and balanced development of a country. The transportation medium needs to develop according to the requirement of the area as it creates the utility of place which is considered as the prime condition for the economic development of Bangladesh. The government of Bangladesh should develop and enforce the specific policy to promote the Easy Bike and develop a law for using the vehicle for transportation medium in the rural and urban area of Bangladesh. The vehicle can be a source of government revenue and it also creates employment opportunity.

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