Volume: 3, Issue: 6
Page: 164-173
2019

ISSN 2520-4750 (Online) & ISSN 2521-3040 (Print)

International Journal of Science and Business

Building Sustainable Green Environment by Reducing Traffic Jam: The Role of Sharing Economy as Ride-sharing An Overview of Dhaka Metropolitan City

Raj Kumar, Yuan Chun, Tanjia Binte Zafar & Nora Ahmed Mothafar

Abstract

This paper examines the CO_2 gas emissions and would find the way to save energy use as a result of adopting ride-sharing system named Pathao and avoiding traffic jam in Dhaka city, the capital of Bangladesh. Most of the people like to stay in an urban area because of the availability of extensive facilities and having proper access of travelling. This analysis recognizes the impacts of ride-sharing Pathao on travelling distance, fleet fuel consumption etc. The result indicates that current ride-sharing system reduces CO_2 emission and helps to save energy usage through individual use ride-sharing Pathao in Dhaka city of Bangladesh. Advanced vehicle technologies are changing faster, and policy instruments regulating their design should evolve accordingly to remain updated. Bangladesh has recently upgraded the emission test procedure for the advance technology Motorcycle.

IJSB
Accepted 07 November 2019
Published 08 November 2019
DOI: 10.5281/zenodo.3533127

Keywords: Ride-sharing, Sustainable, Traffic-jam, Emission, Carbon di-oxaide, Motorbike, Fuel Consumption.

About Author

Raj Kumar, School of Management, Lanzhou university, China.
Yuan Chun, (Corresponding author), School of Management, Lanzhou university, China.
Tanjia Binte Zafar, School of earth and environment science, Lanzhou University, China.
Nora Ahmed Mothafar, School of Management, Lanzhou university, China.

1. Introduction:

The World Meteorological Organization reported that, "In 2016 to the highest level in 800,000 years, the concentrations of CO_2 in the atmosphere surged at a record-breaking speed. "(Heo, n.d.) because of human activities and intense El Nino event, the global average concentrations of carbon dioxide are 403.3 parts per million in 2016, which was 400.00 parts per million in 2015. The report found that, CO_2 concentration rates to today were three to five million years ago, the time Earth experienced similar. The planet was 2-3 degrees Celsius warmer when the sea level was up to 20 meters higher than now. Different kinds of vehicles are the primary sources for CO_2 emission in great amount. Megacities in most of the developing countries are often characterized by poor air quality, and motor vehicles are significant sources of air pollution. Basically, vehicles those are operating by using petrol. CO_2 emissions are very low in case of using petrol but diesel or gas emit more CO_2. In this sense motorbikes emit less CO_2 because mostly motorbikes are run by petrol. Another reason big automobile engine consumes more fuel and emit more CO_2 but motorbike consume less fuel like 1 litter petrol can run at almost 80 km but other vehicles not that much as motorbikes. Both peer-to-peer carsharing and business-to-consumer carsharing are gaining ground in urban areas. Worldwide, carsharing organizations operate in over 1100 cities across at least 27 countries. Earlier this year 2018, Lyft announced that all commuters' rides would be carbon neutral. The plan is to reduce vehicles emission by investing in carbon-free cars into its fleet. There, it's not clear that Lyft- or Uber, or any ride-hailing company stacks up as an excellent environmental citizen in the border landscape of transportation, the sector that recently replaced power plants as the number one sources of U.S carbon dioxide emission. Ride-sharing as a Pathao operates his services in three cities of Bangladesh, which are the capital city in Dhaka, Business city in Chittagong and Tea, tourism city Sylhet. Besides Pathao has ventured in merchant, E-commerce, food delivery and courier services. Pathao started his journey in 2015 as delivery services in Dhaka city of Bangladesh with its fleet of motorcycles and cycles. After 2016, Pathao has begun a new era of ridesharing in Dhaka city. According to Bangladesh Road Transportation Authority (BRTA) (Table 2), due to the popularity of ridesharing in Dhaka city motorcycle has increased to almost fifty percent from 2016 to 2018.

Table: 1. Increasing motorcycle in Dhaka city:

Vehicle Type	2012	2013	2014	2015	2016	2017	2018	Total
Motor Cycle	32810	26331	32894	46764	53738	75251	104064	631340

Source: Bangladesh Road Transportation Authority (BRTA).

(Belk, 2014)Ride-sharing is a rapidly changing industry and measuring every on-demand trip that might have been made by cars, bikes or buses. The studies are analyzing the effects of these transportation network companies on the urban environment so far seen to show more damage than hailing. A major survey of Dhaka city found that Uber, Pathao and similar on-demand services are taking the place of trips that might have been made by transit and walking or biking, suggesting that ridesharing is contributing more vehicle to reduce travelling time. Offsetting some of the pollution created by ridesharing vehicles on the road does not change the fundamental dynamics of this market. Without serious policy intervention, demand for comfortable and convenient rides are likely to grow and less costly to operate and the congestion is expected to worsen. (*B. Ciuffo*, G. Fontaras*, n.d.)The

atmospheric air pollution conditions and its trends are also included in the Compendium. In rural Bangladesh, air pollution problems have not yet become a point of concern due to a smaller number of motorized vehicles and industries there. Anyway, traffic jam is the most dangerous for CO_2 emission, and Bangladesh has one of the worst traffic jams in the world (Table:2). For traffic jam fuel consumption is high, and because of high fuel consumptions, CO_2 emission is also high.

Table:2. Dhaka has got the first position in the world of traffic jam:

Rank	City	Traffic Index	Time Index (In Minutes)	Time Expo. index	Inefficiency index	CO_2 emission index
1	Dhaka, Bangladesh	297.76	63.25	20109.74	366.79	5409.62
2	Kolkata, India	283.68	61.06	17140.95	310.48	5486.86
3	Delhi, India	277.81	55.97	11345.97	310.54	9545.31
4	Nairobi, Kenya	277.66	56.73	12122.16	303.23	8725.53
5	Jakarta, Indonesia	274.39	55.91	11288.35	308.59	8961.23
6	Colombo, Sri Lonka	273.48	58.20	13700.35	311.45	6493.05
7	Mumbai, India	271.95	57.25	12660.20	279.84	7303.27
8	Manila, Philiphines	271.86	56.44	11823.00	289.67	8039.58
9	Sarjah, United Aranb Amirates	256.76	50.43	6658.29	296.32	11559.52
10	Tehran, Iran	254.90	53.51	9074.60	257.94	8111.50

(Source: Multinational Research Firm Namibio.)

Time index means to reach destination considering to go work place and school. Inefficiency index indicates the traffic management system in Dhaka city and finally carbon dioxide index. Due to excessive accumulation during traffic jam carbon dioxide emission is higher. Dhaka city is on top not only in traffic jam but also traffic inefficiency and time wastage index. Namibio has prepared a list with consider of 207 cities of different countries. Table: 1 includes the time-honored, time wasting, the inefficiency and the carbon dioxide emissions indicators. Dhaka scores the top of time-honored, time wastage and inefficiency and in CO_2 emission where the rank is 109^{th}, all over the world in 2019. This paper quantifies carbon dioxide and saves energy usage for the ridesharing as compared to one equivalent person-kilometer travelled under the traditional transportation system approach in Dhaka city. The calculations recognize the vehicle replacement rate changes that come with sharing, as well as the fuel efficiency improvements from faster fleet turnover, travel distances changes, reduced parking demands, and shifts in the use of alternative modes. This research focuses on the potential changes of emissions of CO_2 by using ridesharing named Pathao.

2. Methodology:

To assess vehicular emissions accurately, one should carefully determine the vehicle distribution per emissions class. If data on the vehicle emission standard is not available, the year of production indicated in the vehicle registry could be used as a proxy for the emission standard. The parking lot of surveys can provide information on the age distribution of passenger Pathao. The largest transport companies can provide detailed data in the city for heavy-duty vehicles and buses. The CO_2 emission from Pathao used data is primary and

secondary is used in this research paper. Some data were collected by impersonal interviewing with Pathao driver and some data were collected by key person interview. To get an estimated result from Pathao we have followed carbon emission calculator for measuring CO_2 emission with consider travelled km, motorbike carbon footprint calculation and also used stataSE15. The routes on which roadside emission inspection is to be carried out should include arterial as well as residential roads and different traffic conditions. However, in this study, in Dhaka city, we chose arterial and local streets, but for the other towns, we selected only main roads where we could get all types of vehicles for testing.

3. The role of ridesharing in reducing emission management

Dhaka city produces a significant amount of gases that lead to increase global greenhouse gases emission that causes environmental pollution heavily. Vehicle emission is one of the most significant issues plaguing our earth. According to the Bangladesh Road Transport Authority (BRTA), the numbers of vehicles registered in Bangladesh were about 497374 in 2018. The BP Statistical Review of World Energy denoted in 2018, 82.8 million tons of carbon dioxide (CO_2) emission were estimated during 2017. The World Bank reported, 14.196% of CO_2 emission were estimated from transportation during 2014 in Bangladesh. This number needs to be reduced, and this can be easily accomplished through the combined use of proper public transportation management system, walking and bicycling, carpooling, and ridesharing programs such as Uber, Pathao, OBHAI, Sohoz etc. Anyway, when people must derive their vehicle, gas emissions can be reduced by reserving a parking spot in advance through a parking-sharing service such as ParqEx. It will remove any need to do extra driving to find a place.

3.1. Avoiding Traffic Jam can reduce CO_2 emission:

Traffic jam is the main reason for CO_2 emission in Dhaka. Traffic jam that lead to reduce vehicles speed and every vehicle runs only 3-4 km per hour. On the other hand, it creates 2.32kg CO_2 emission per litter. Therefore, the amount of CO_2 emission is more. But ridesharing helps to reduce traffic jam through on demand transportation system. In 15th August 2015 Bangladesh Road Transportation Corporation reported, only for traffic jam and road accident 20 thousand core BD taka being wasted per year. It consumes more than 8.16 million working hours in a day and spoils 40% business work hours as well.

Table: 3. Damage for traffic jam

Source	Lost Amount in Bd taka in core
Working hours	12
Transportation wastage	4
Fuel wastage	575
Accidental damage	50
Environmental damage	2200

Source: Bangladesh Road Transportation Authority in 2013(BRTA).

3.2. High fuel consumption emits more CO_2:

For ridesharing, mostly 80% of Pathao drivers choose more mileage motorcycle. According to the opinion of Pathao drivers, we have found that, Pathao drivers can make more income but wasting less fuel as compared with others ridesharing vehicles. According to Bangladesh Recondition Vehicle Import and Diller Association, nowadays bike companies produce a

modern hybrid engine for reducing CO_2 emission from the air which runs 8 km more than the previous version engine. This innovative engine reduces 35-45% CO_2 emission from the environment. The world bank reported in 2014, 14.196% of total fuel combustion was CO_2 emission from transportation while in 2013 it was 13.725%. Ridesharing helps conserve non-renewable energy sources.

4. Analysis and Result:

Research studies have examined the environmental impact of ridesharing operations to various extents. A spatially disaggregated, gridded, bottom-up emissions inventory for road transport in Dhaka has been developed in this study. In the absence of local emissions factors for vehicles, regional-literature-based elements are used. Pre-conversion and post-conversion emissions were distributed among grids based on road type and road length in each network and relative vehicle volume in those roads using.

Table: 4. Daily CO_2 emission by amount of Fuel Used:

Vehicle Type	Fuel Type	Travelled in Km	Fuel Used in Litters	CO_2 produced by Fuel in Kg
Motor Bike	Petrol	110	2.5	5.78
Motor Bike	Petrol	100	2	4.62
Motor Bike	Petrol	60	1.5	3.47
Motor Bike	Petrol	55	1.5	3.47
Motor Bike	Petrol	50	1	2.31

According to the data that has been collected from the field show that, in Bangladesh people use fuel-based motorbike (Table: 4 and 5). They mainly use petrol. In average one motorbike daily travel 75.27km. the maximum mileage of one motorbike is 110km and minimum is 26.37km(daily). For that the daily average fuel consumption rate by one motorbike is 1.7 litter, where maximum is 3 litter and minimum are 0.56 litter. According to this the daily average co2 emission is 3.02kg. comparing to other vehicles the rate is so less. Which explain the positive side of ridesharing system.

Table: 5. Calculate CO_2 by Mileage Using Emissions Motorcycle Footprint Calculator:

Average Mileage Daily(km)	Average Fuel Cost Daily (1/100km)	Fuel Type	Average CO_2 Produce Daily
75.363	1.677	Petrol	3.02 kg

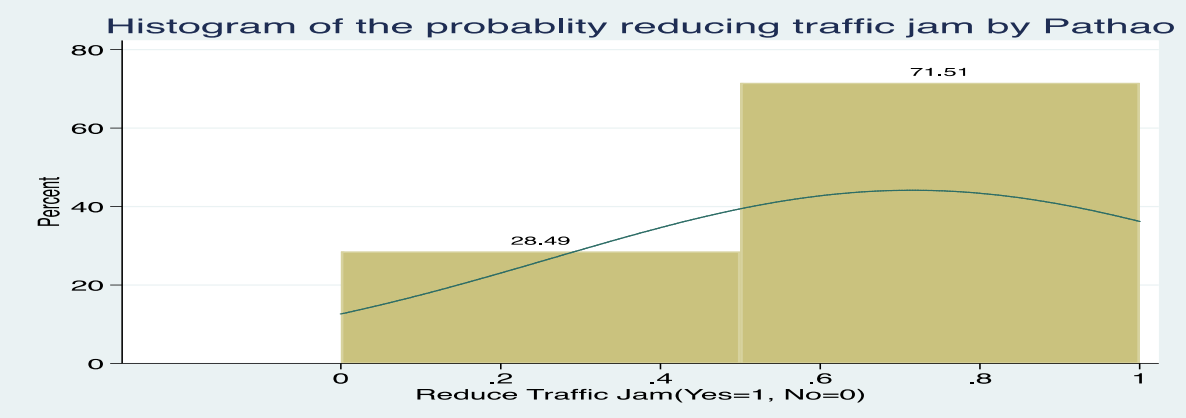
Table: 6. Motorbike carbon footprint calculator:

Engine Size	125 cc
Mileage (km)	75
Efficiency g/km (+21%)	69.9425
Total Motorbike Footprint	0.01 metric tons

The carbon footprint calculator helps to measure in tons the total CO_2 emissions caused directly and indirectly by a person, event or product, organization. Carbon footprint calculator considered all six greenhouses gases: Methane (CH_4), Carbon Dioxide (CO_2), Nitrous oxide (N_2O), Hydrofluorocarbons (HFC_s), Sulfur Hexafluoride (SF_6), Perfluorocarbons

(PFC_s). Motorbike carbon footprint mention that if engine size is big, CO_2 emission should be more. (Table: 6) Using motorbike carbon footprint calculator get maximum CO_2 emission from Motorbike where should be mention engine size and mileage.

Figure: 1. The probability for reduce traffic jam through Pathao



Traffic jam is not just a nuisance for drivers: It's also a public health and bad news for the economy. Transportation studies put the annual cost of $160 billion, 7 billion hours loss of time and 3 billion gallons of fuel burned in New York City, which creates more CO_2. (Fig: 1) The histogram for the probability reducing traffic jam in Dhaka city showing for ride-sharing like Pathao is the best way reducing traffic jam and helps emission. In this histogram 28.49% reviewers said Pathao is the main reason for traffic jam but 71.51% answered Pathao can reduce traffic jam and reduce emission. An MIT new study suggests that ride-sharing can help to improve traffic jam using carpooling options from companies like Uber and Pathao could reduce the number of vehicles 75% on the road. Rus stated that a system like this could allow drivers to work shorter shifts, while also creates less traffic, cleaner air and shorter less stressful commutes. Rus indicates ride-sharing services have enormous potential for positive societal impact concerning congestion, pollutions and energy consumptions. Li, Hong and Zhang prove empirical evidence that ride-sharing services such as Uber significantly reduce the traffic jam in the urban area. Less traffic jam means less fuel uses less produce CO_2 and better air quality.

5. Discussion

Poor traffic and parking management and irregular maintenance of the vehicles are responsible for high emission from the vehicles. The level of pollution from this source is still high, and the main polluters are motorbikes, diesel drove old buses and trucks. (Ert, Fleischer, & Magen, 2016)Various types of harmful hydrocarbons and organic oxygenates (acrolein, acetaldehyde), carbon monoxide, nitrogen oxides and soot particles emitted through the exhaust of motor vehicles that cause serious health hazard to a human being. In this paper we have tried to introduce CNG and reduce emission from the environment. The CASE website notes that Dhaka air consists of common pollutants, including particulate matter, Sulphur Dioxide (SO_2), Carbon Monoxide (CO), Nitrogen Oxides (NOx), ground-level; Ozone(O_3), volatile organic compounds, Hydrogen Sulphide (H_2S), Sulphate and Nitrates. Real-time ridesharing is especially suitable for daily commuting compared to driving alone. Because such trips tend to happen at peak travel times, when traffic jams cause cars to pollute an 80% more, additional benefits for the urban environment and climate change mitigation are expected by a reduction in the number of cars riding daily by the cities with a single occupant, and their related CO2 and NOx emissions. (Guttentag & Smith, 2017), Households residing in

relatively dense urban neighbourhoods with good access to transit and travelling a few miles in private cars roughly 10% of the U.S. people are considered as a candidate for carsharing. His paper analysis recognizes the cradle-to-grave impacts of carsharing on vehicle ownership levels, parking demand, fleet fuel economy partly due to faster turnover, travel distances, alternative modes and associated infrastructure. Current carsharing helps to reduce their average individual transportation energy use and GHG emissions by approximately 51% upon joining a carsharing organization. Few research papers in the world about ride-sharing is the best way to reduce CO_2 emission. But in this research paper find out the benefit of ride-sharing about CO_2 emission through reducing traffic jam. If possible to reduce traffic jam all over world fuel consumption can control and reduce emission. It is impossible to control whole world CO_2 emission but ride-sharing can contribute to reduce CO_2 emission from the environment. Pathao is one of the biggest companies in Dhaka city and Pathao can reduce the traffic jam with little fuel consumption. Generally, Pathao is little bit expensive for going anywhere in Dhaka city but for the students and employees who have to their destination on time. In this research paper, researcher find out for the specific commuter who regular uses the Pathao in the Dhaka and try to find out the emission a little bit. If the Pathao will be little bit cheap to travel and it becomes more popular with safety, it is possible to reduce CO_2 emission a little bit from Dhaka city and also possible to reduce traffic jam from worst situations. In developed country CO_2 emission is very little because of ride-sharing and advance technology. (Fang, Ye, & Law, 2016), in a short notice changing and developing landscape, traditional policy options and policy-making approaches should be reconsidered for providing the optimal benefits to society. The real example is the field of vehicle fuel consumption and CO_2 emission in Europe. Advanced vehicle technologies are changing very fast, and policy instruments regulating their design should evolve accordingly to remain updated.

6. Conclusion:

Vehicle emission is one of the major contributors to bringing about our current state of climate change. The U.S Energy Information Administration denoted that, wherever a vehicle burns one gallon of gasoline, about 20 pounds of carbon dioxide (CO_2) is produced in return. A little more than 22 pounds of CO_2 emissions are created for every gallon of burned diesel. In 2013, an estimated 1,522 million metric tons of CO_2 was produced by vehicles alone. (Biofriendly Planet by Tara). It's a simple way to take back time by taking a car off the road. The program has significant benefits for employers and commuters, and it's great for the environment indeed. According to Ridesharing company, each carpool (with four riders) reduces greenhouse gases by 12,000 pounds annually.

Many researchers unable to find out the effective solution for avoiding traffic jam. But traffic jam should be removeable through proper urban traffic planning by widening road and making over bridge for smoothing transportation of passerby. Although, there are many over bridges and having advance technology for reducing traffic jam but engineers have failed to give the solution for smoothing transportation. Because every day different kinds of vehicles are increasing in the road and make it more congested to move forward in time. Because in the Asian country most of the drivers are not following traffic rules. After all, sharing economy inspires the private firm and government to make a good plan for solving traffic jam through smooth transportation. Many researchers found that traffic jam is the main reason for more CO_2 emission. If vehicles are not moved smoothly or according to their engine acceleration fuel consumption must be increased. According to this research paper, motorbikes can go 75 miles highest per hour within 1 litter but because of traffic jam, it can

go the same distance but consuming 2 more litters of fuel. Finally stated that only for traffic jam CO_2 emission is almost in double. CO_2 emission also depends on driving behavior. There are many researches in the world about emission from the environment but mostly became successful to reduce CO_2 emission from vehicles. (*Ravindra Kumar*,)fuel consumption may increase by up to 40% for bad road condition and vehicle technology. Smooth driving without traffic jam shows a more significant impact on emission about 15-17% lower as compared to emissions emitted during aggressive driving. Several studies have confirmed the effect of driver behavior on fuel economy and emission. Emission can be measured in terms of gm/km, and fuel economy can be measured in terms of mile/gallon: a measurement of how many miles a vehicle can travel. But Ride-sharing has change it dramatically through innovating new technologies and sharing the vehicles. Ride-sharing find out the way how to solve traffic jam from world and make every transportation smooth in the world. In America, Europe, Middle east country, African country and Asian country ride-sharing come out for reducing traffic jam and smooth transportation. For the Pathao, recently public bus got relax to take overload passenger. In Dhaka city CO_2 emission can be reduced if the number of public bus and private cars also reduce.

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Cite this article:

Raj Kumar, Yuan Chun, Tanjia Binte Zafar & Nora Ahmed Mothafar (2019). Building Sustainable Green Environment by Reducing Traffic Jam: The Role of Sharing Economy as Ride-sharing An Overview of Dhaka Metropolitan City. *International Journal of Science and Business,* 3(6), 164-173. doi: https://doi.org/10.5281/zenodo.3533127

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