Public Transport and Environmental Pollution: A Case Study of Dhaka City

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Abstract

Environmental pollution is one of the main problems of national and international level. Environmental pollution is very harmful for Bangladesh because, different natural disasters occur due to environmental pollution. A study has conducted to explore the environmental pollution of Dhaka city and to find out the environmental pollution caused by public transport. The study was documentary analysis type. Data and information were collected from secondary sources i.e. data and information were collected from books, journals, research report, newspaper, periodicals, internet etc. From the result it was found that the highest acceptable level of sulphur dioxide, SO2, is 60 microgram per cubic meter of air. But it has been recorded at 300 to 500 microgram in Dhaka. Near Farmgate in the city centre 385 micrograms was found (DoE, UNEP 2011). The amount of nitrogen is also three times higher than that of normal. The measurement of SPM in the industrial area of Tejgaon showed 1849 micrograms per cubic meter (2007) as opposed to the allowable limit of 500 (DoE, UNEP 2001). There are important variations and during the monsoon season air is cleaner. During the dry season when for instance the brick kilns are active using wood, coals and used rubber wheels as their source of energy the emission increases. Concentration of lead in ambient air of Dhaka city has been marked as world’s record of 463 nanogram per cubic meter offsetting earlier record of Mexico City (383 ng) and other cities like Los Angeles (70ng). Gaseous and particulate emissions removed downwind either by direct adsorption on precipitation or by deposition on surfaces, Many of the pollutants deposited dry on the surface return to hydrological cycle during the next rainfall as they are washed from the surface. The University of Engineering (BUET) found 151 to 210 mg lead per litre in Dhanmondi lake. It is most likely that most of the wetlands surrounding Dhaka city are extremely polluted. The average suspended particle leads to particulate matter (PM) rises as high as 227 mg per cubic meter, whereas according to WHO yearly maximum average value should range between 60 to 90 mg per cubic meter. There is a great concern about the role of air quality in cancer mortality incidence. Government should take prompt action against environmental pollution in Dhaka city for the betterment of the mass people and to protect the environment.

Keywords: Public Transport, Environment, Pollution, Green house gas, Vehicles, Emission.

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1. Introduction

Huge numbers of motor vehicles ply in Dhaka city daily. According to the Department of Environment and the BRTA only 6.8 percent of the vehicles are fit to be driven (2016). Accordingly more than 90 percent of the vehicles in Dhaka are faulty and emit smoke far exceeding the prescribed limit (UNEP 2016). Trucks and buses of old construction are big single polluters as well as minibuses and small public transport vehicles due to sheer numbers. According to the Asian Development Report 2015, Dhaka is the most polluted city of the world, has made a world record, abominably, as a number one pollutant breaking earlier record of Mexico City. “Outburst of airborne disease”, a medical study claims, “has swept the city dwellers in mass”. It ranges from skin diseases to cancer. Numerous ailments as eye irritant, severe headache, amonexia, disruption of blood circulation, respiratory problem and even death are being seen as a result of present environmental disorder (Rahman, 1998).

In air pollution, air is the vehicle that conveys pollutants to biota (Prior and Lopenz, 1992). The chemistry of the pollutants in air is a dynamic process. For example, SO$_2$ emissions are converted to sulphate, sulphuric acids, ammonium sulphate, ammonium bisulphate, and when inhaled, these compounds have properties of particulate. Hydrocarbon pollutants are oxidized and the oxidation products are important in the production of troposphere ozone. Ambient air of Dhaka has become a deadly pollutant reaching a level of all times and it can be declared as one of the worst polluted cities of the world. Eight million vehicles runs in Los Angeles show lead content between 0 to 70 nanogram (part per billion) lead content in cubic meter, whereas Dhaka with 200,000 vehicles has been marked as world record of 463 nanogram (one part of a billion).

2. Objectives of the Study

The objectives of the study are as follows:

1. To explore the environmental pollution of Dhaka city.
2. To find out the environmental pollution caused by public transport.
3. To provide policy recommendations.

3. Methodology of the Study

The study was basically based content analysis. Data and information were collected from secondary sources i.e. data and information were collected from books, journals, research report, newspaper, periodicals, internet etc.

4. Results and Discussion

4.1 Vehicles Causing Environmental pollution in Dhaka metropolitan city
4.1.1 Cars
Cars are luxurious vehicles for the elite persons in Dhaka city. The numbers of cars are more than any other vehicles. Day by day the numbers of cars are also increasing rapidly. Each and every day cars are adding huge amount of green gasses.

4.1.2 Trucks
Trucks are used for carrying goods from one place to another place in Dhaka city. Some outside trucks entered in Dhaka city to carry vegetables, fruits, fishes, consumer goods and many other goods. These types of trucks entered into Dhaka city after 11.00 pm and leave before 6-7.00 am. These types of trucks are also are adding huge amount of green gasses.

4.1.3 Auto tempo
The auto tempo is like the auto rickshaw based on three wheeled scooter chassis, but instead of three seats behind, its seat arrangement is such that it can carry 10 persons at the back and two persons at the front, beside the driver. The auto tempo generally travels on specific routs. Each and every day Auto tempos are adding huge amount of green gasses like Carbon monoxide, Carbon di-oxide, Sulphur Di oxide, etc. in Dhaka city

4.1.4 Taxicab
The taxicabs are like the passenger cars but are operated by a company or by an individual and available to all persons who meet the conditions of a contract for carriage (i.e. pay prescribed prices). Each and every day Taxicabs are adding huge amount of green gasses

4.1.5 Large buses
Large buses are defined according to regulation as buses with more than 32 seats, but more generally large buses are considered to be ten (10) meters or more in length. According to BRTA report, 26095 numbers of buses are registered up to 2016. Each and every day large buses are adding huge amount of green gasses.

4.1.6 Mini buses
Mini buses are defined as buses with 15 to 30 seat capacity, excluding the driver. Most mini buses are around 8 meters in length, with locally manufactured bodies and Isuzu, Hino or Tata chassis and engines. Each and every day Minibuses are adding huge amount of green gasses.

4.1.7 Human haulers/Auto tempo
Human haulers are 9 to 15 seated, generally in the form of a converted pickup truck with two benches added for passenger seating. Most have diesel engines, although some are petrol
fueled and a small number have converted to CNG. Each and every day Human haulers are adding huge amount of green gasses.

4.2. Environmental pollution in Dhaka

Emissions inventory of mobile sources in Dhaka show that contributions of different vehicles dominate certain types of pollutants. Petrol-fueled light-duty vehicles (cars/ vans) and auto-rickshaws contribute 85% Carbon monoxide (CO), while diesel-fueled buses and trucks contribute 84% of total Nitrogen oxides (NO\textsubscript{2}). Two- and three-wheeled auto-rickshaws contribute about half of the total hydrocarbon (HC) emissions, while particulate matter (PM) emissions come mostly from diesel buses and trucks (45%), and auto rickshaws (40%) (ADB, 2006).

**Figure 1: CO\textsubscript{2} Emission by modes**

From the result it was found that 26% CO\textsubscript{2} emission is occurred by Bus which was the maximum followed by 25% CO\textsubscript{2} emission is occurred by Car. Only 6% CO\textsubscript{2} emission is occurred by Auto Rickshaw/CNG which was the minimum. On the other hand 13% CO\textsubscript{2} emission is occurred by Taxi Cab, 7% CO\textsubscript{2} emission is occurred by Motor Cycle, 11% CO\textsubscript{2} emission is occurred by Jeep/Micro and 12% CO\textsubscript{2} emission is occurred by Truck. It is necessary to mention here that more CO\textsubscript{2} emission is occurred truck but Truck is restricted to enter all time in Dhaka city. Truck is permitted to enter in the Dhaka city only in the night after 12 a.m. and the Truck must have to leave before 6 p.m. Within the short time 12% CO\textsubscript{2} emission is occurred by Truck.
From the result it was found that 26% NO$_2$ emission is occurred by Bus which was the maximum followed by 24% NO$_2$ emission is occurred by Car, Only 3% NO$_2$ emission is occurred by Taxi Cab which was the minimum. On the other hand 22% NO$_2$ emission is occurred by Jeep/Micro Bus, no NO$_2$ emission is occurred by Motor Cycle, 4% NO$_2$ emission is occurred Auto Rickshaw/CNG and 21% NO$_2$ emission is occurred by Truck. It is necessary to mention here that more NO$_2$ emission is occurred truck but Truck is restricted to enter all time in Dhaka city. Truck is permitted to enter in the Dhaka city only in the night after 12 a.m and the Truck must have to leave before 6 p.m. Within the short time 21% NO$_2$ emission is occurred by Truck .

**Figure 3: CO emission by modes**
From the result it was found that 41% CO emission is occurred by Car which was the maximum followed by 26% CO emission is occurred by Auto Rickshaw/CNG, Only 3% CO emission is occurred by Truck which was the minimum. On the other hand 4% CO emission is occurred by Bus, 4% CO emission is occurred by Taxi Cab, 17% CO emission is occurred by Jeep/Micro and 5% CO emission is occurred by Motor Cycle.

5. Conclusion

Air pollution is recognized as a major health hazard. Vehicle emissions are increasingly being recognized as the dominant cause of air pollution and health problems in Dhaka city (Bhuiyan, 2001). The pressing demands for motorized form of personal mobility are generating pressures on road network and resulting in congestion, which threatens the sustainability of the socio-economic progress. Our country generally has been much slower than other industrialized countries in recognizing these risks and taking technical steps to reduce air pollution from automobiles. A few meaningful research works have been done in Bangladesh in this regard. Most recently a detail study was carried out by Jaigirdar (2008) to identify the motor vehicle induced pollution in Dhaka City.

According to Jaigirdar (2008), the maximum instantaneous concentrations of SO\(_2\), NO\(_2\) and CO are 0.7 ppm, 0.3 ppm, and 93 ppm respectively. Instantaneous concentration of SO\(_2\) and NO\(_2\) are high at two intersections named Gulistan and Mohakhali where diesel fuelled vehicles like busses, trucks operation are high. The concentration of CO is high where car, microbus, two stroke vehicles like baby taxi and tempo movements are high. Most of the road intersections are highly polluted by SO\(_2\) and NO\(_2\). Although the concentration of CO is seemed to be moderate as compared with SO\(_2\) and NO\(_2\), the concentration of CO in most of the intersections is harmful for heart patients (Stewart, 1975). Large number of rickshaws and other vehicles in the city streets frequently cause severe traffic jam, which consequently cause the city dwellers to be exposed to highly polluted air for a long period and immediate surroundings of vehicle emission. This causes serious damage to public health. SO\(_2\) emission of truck is highest 5.98 gm / 1 Liter of fuel consumption, followed by tempo 4.78 gm / 1 Liter and double decker bus 4.25 gm /1 Liter of fuel consumption. SO\(_2\) emission for premium bus is 2.69 gm / 1 Liter of fuel consumption, whereas from car and baby taxi is 2.85 gm / 1 Liter and 3.6 gm / 1 Liter of fuel consumption respectively.

Diesel fuelled vehicles like truck, bus etc produce high rate of SO\(_2\). NO\(_2\) emission of truck is the highest, which is 31.65 gm / 1 Liter of fuel consumption. For premium bus, car, tempo and baby taxi, the SO\(_4\) emissions are 18.87 gm / 1 Liter, 10.39 gm / 1 Liter, 1.99 gm / 1 Liter and 2.39 gm / 1 Liter of fuel consumption respectively. CO emission of microbus is the highest, which is 276.2 gm / 1 Liter of fuel consumption, followed by tempo and baby taxi that are 268.3 gm / 1 Liter and 226.5 gm / 1 Liter respectively. Estimated total emissions of SO\(_2\), NO\(_2\) and CO in Dhaka city are 5.43 ton / day, 21.57 ton /day and 215.34 ton / day respectively. Bus/minibus emits the highest amount of SO\(_2\) (23% of daily emission) and NO\(_2\) (32% of daily emission). In case of CO emission car takes the lead and emits 40% of total daily emission. Baby taxi also emits a significant amount, which is 26% of total daily CO
emission. Total daily emission of SO$_2$, NO$_2$ and CO indicates that emission from Dhaka’s vehicles is higher than the Mumbai city with respect to number of vehicles (Jaigirdar, 2008). Air pollutants are increasing in the Mega city of Dhaka in Bangladesh. This is an awful threat for the sustainable living of human beings in this city. People have been facing various diseases due to the increase of toxic air pollutants. Air pollutants such as, volatile organic compound (VOC), carbon dioxide(CO$_2$), carbon monoxide(CO), sulfur dioxide(SO$_2$), nitrogen oxide (NO$_2$), hydrogen sulfide (H$_2$S), have increased significantly in Dhaka. Due to the increasing levels that exceed the standard limits of each pollutant, different health concerns have developed among the community people in this city. In this manner, rate of mortality has been increasing also. As a result, research on air quality parameters and their impacts on human health are absolutely important. It is expected that the monitoring of air quality parameters regularly and discovering their impacts on a sustainable environment will provide standard guidelines for the improvement of urbanization in relation to the sustainable livelihood.

6. Recommendation

The recommendations of the study are as follows:

1. Government should take immediate actions against the vehicles that emit green house gas like Carbon di-oxide, Carbon mono oxide, Sulphur di-oxide, Hydrogen Sulphide etc.
2. The old and fitness less vehicle should be eliminated from Dhaka city.
3. Metro Rail transportation system should be launched.
4. More plants should be planted in Dhaka city so that the plants intake Carbon di-oxide and emit oxygen to the environment.
5. Awareness for transport owners, drivers and passengers should be ensured. Print and electronic media can play a vital role for awareness building regarding pollution caused by public transport.
6. Government can make a policy for those people who are directly involved with environmental pollution through transportation.
7. Feasibility study can be done for underground/tube rail transportation system.
8. Further study can be done to solve the problem.
References:

Alam, J.B., Jaigirdar, M. A. and Rahman, M.H. (2000), “Level of NO\textsubscript{x}, SO\textsubscript{x}, CO and SPM Pollution in Dhaka City and Their Possible Consequences”, Bangladesh Environment 2000, an Outcome of ICBEN, BAPA (Bangladesh Poribesh Andolon).


