



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 9, Issue 9, September 2020

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com



Transportation Carbon Footprints in the Context of Bangladesh

Samira Musherrof Hussain¹, S. M. Shafiul Alam Fahad², Tanver Alam Tamal³, Shahadath Hossen Mon⁴
Md. Nasir Uddin⁵, Sabbir Ahmed⁶, Nahidul Islam⁷

Lecturer, Department of Civil Engineering, Stamford University Bangladesh, Dhaka, Bangladesh¹

Undergraduate Student, Department of Civil Engineering, Stamford University Bangladesh, Dhaka, Bangladesh²

Undergraduate Student, Department of Civil Engineering, Stamford University Bangladesh, Dhaka, Bangladesh³

Undergraduate Student, Department of Civil Engineering, Stamford University Bangladesh, Dhaka, Bangladesh⁴

Undergraduate Student, Department of Civil Engineering, Stamford University Bangladesh, Dhaka, Bangladesh⁵

Undergraduate Student, Department of Civil Engineering, Stamford University Bangladesh, Dhaka, Bangladesh⁶

Undergraduate Student, Department of Civil Engineering, Stamford University Bangladesh, Dhaka, Bangladesh⁷

ABSTRACT: This paper has two main objectives: firstly, to provide quantitative information on the potential greenhouse gas in terms of transportation carbon footprints and reductions resulting from a number of recent and road transport scenarios and earlier study in this field; secondly, to illustrate the emission reduction measures available to local transport planners including highlight the potential for these measures to be integrated into strategies that deliver the GHG emission priorities. The results are drawn from a case study of Bangladesh. We conclude that while technology can play a large part in reducing emissions of CO₂ to environment, air pollutants, demand management is crucial to the delivery of long-term greenhouse gas emission reduction and ultimately of air pollutant emissions too. This study also reveals the recent speculation pertaining to carbon footprints emission in Bangladesh where ecological imbalance lead to unbearable liveable condition with unsustainable growth in every sector resulting the degradation of life quality. Transportation sector in Dhaka is one of the major adherents behind ecological deterioration by emitting enormous CO₂ in atmosphere.

KEYWORDS: Transportation, Greenhouse gas, Emission, Air Pollution.

I. INTRODUCTION

A greenhouse gas (GHG) is any gaseous compound that is capable of absorbing and emitting infrared radiation, thereby allowing less heat to escape back to space, and 'trapping' it in the lower atmosphere. The major greenhouse gases in Earth's atmosphere are water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and ozone (O₃). CO₂ emissions from transport contains emissions from the combustion of fuel for all transport activity, regardless of the sector, except for international marine bunkers and international aviation. This includes domestic aviation, domestic navigation, road, rail and pipeline transport, and corresponds to IPCC Source/Sink Category 1 A3. The transport sector is responsible for the emission of more than a quarter of carbon dioxide (CO₂) world-wide, as well as considerable shares of methane (CH₄), and nitrous oxide (N₂O) emissions, and is thereby one of the largest single contributors to global greenhouse gas (GHG) emissions. [2] Unbounded emissions of greenhouse gases to atmosphere warmed the planet to levels that have never been experienced in the history of human civilization. [3] Climate change due to global warming could have far-reaching and unpredictable environmental, social, and economic consequences. [3] A carbon footprint is the total greenhouse gas (GHG) emissions caused directly and indirectly by an individual, organization, event or product, and is expressed as a carbon dioxide equivalent (CO₂e). A carbon footprint accounts for all six Kyoto GHG emissions [4]:

- Carbon Dioxide (CO₂)
- Methane (CH₄)
- Nitrous Oxide (N₂O)
- Hydro fluorocarbons (HFCs)
- Per fluorocarbons (PFCs)
- Sulphur hexafluoride (SF₆)

II. LITERATURE REVIEW

Transport sector is an important sector to calculate the footprint of an urban area. In the urban area a large number of vehicles moves per day. They use a large volume of fossil fuel. Burning these fuels in the chamber of these vehicles they produce a huge amount of CO₂ which they exhaust in the air daily. So, to reduce the effect of these extra CO₂ in the air we need to take some measure which can absorb this extra CO₂ from the air. Traffic congestion in Dhaka eats up around 5 million working hours every day and the average speed of vehicles during rush hours has come down to 5 kmph, according to the Accident Research Institute of BUET. The traffic congestion in Dhaka is wasting around 3.2 million working hours daily, due to the current average driving speed of hardly 7 kilometres an hour, costing the economy billions of dollars, according to a World Bank report. If the current traffic jams in the mega city continue, the pace may gradually decline to 4 kilometres per hour or even slower than walking speed, the report feared. The hourly traffic speed was 21 kilometres even a decade ago. In July, 2017, a World Bank analysis had said as the speed may drop to 4 kmph by 2035, slower than the walking speed, it added "Congestion in Dhaka eats up 3.2 million work hours per day. This cost the economy billions of dollars every year," The fuel consumption of vehicular traffic and associated CO₂ emissions on a given road section depends strongly on the velocity profiles of the vehicles. A typical relation between CO₂ emission and vehicle speed adapted from Barth and Boriboonsomsin [5] is shown in Fig. 1 Analysis of data shows that if vehicle velocity reduces from 40 mile/h to 15 mile/h due to traffic congestion, the fuel consumption and CO₂ emission can be increased up to 80% [6]. Therefore, country needs to adopt congestion mitigation strategies to increase traffic speeds and reduce CO₂ emissions.

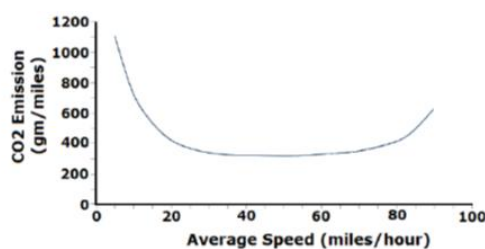


Fig. 1 Relation between vehicle speed and CO₂ emission. [5]

III. ANALYSIS

There are various types of papers, journals, the articles including lavish no. of the reports are publishing regularly on the virtual and non-virtual platform in sense of disseminating the awareness and suggesting mitigation measures of the GHG emission to environment. To estimate the transportation footprint of Bangladesh vehicles and road network, some sequential steps have been followed. At first the total number of vehicles travel in Bangladesh has been collected from Bangladesh Road transport Authority (BRTA). For final emission for vehicles, data are collected from the research that are depicted in reference part. Then for average emission factor method, CO₂ emission factors for various types of vehicles and various fuel types, has been collected. The total emission for different vehicle groups has been propounded, the overall tons of CO₂ emission has been determined. Here the carbon sequestration factor has been obtained from Climate Leaders – EPA, USA. From this process the energy footprint for vehicles and vehicle activity in Bangladesh has been obtained. While for Road pavement footprint, the percentage of area under road network has been obtained from Detail Area Plan (DAP). The dearth of facility in this COVID 19 pandemic situation, had to carry out research manages to take different adoption, had to go through internet sources as we would not present to the desired location owing to whole country lockdown. We tried to overcome every plausible counterproductive error to countenance the study work in sentient.

IV. RESULTS AND DISCUSSION

Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring. In 2018, CO₂ emissions per capita for Bangladesh was 0.56 metric tons. Between 1999 and 2018, CO₂ emissions per capita of Bangladesh grew substantially from 0.19 to 0.56 metric tons rising at an increasing annual rate that reached a maximum of 15.42% in 2001 and then decreased to 6.64% in 2018. [12]



DATE	VALUE	CHANGE %
2018	0.56	6.64 %
2017	0.52	2.19 %
2016	0.51	3.13 %
2015	0.50	9.86 %
2014	0.45	3.86 %
2013	0.44	2.59 %
2012	0.42	5.14 %
2011	0.40	4.92 %
2010	0.38	9.18 %
2009	0.35	5.17 %
2008	0.34	11.50 %

Table. 1 CO₂ emissions per capita

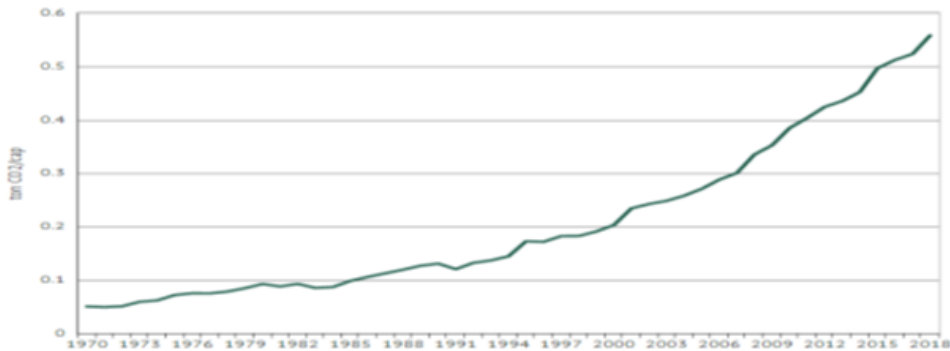


Fig. 2. Bangladesh CO₂ emissions per capita.

Growing middle-class people, about 7% of the total population in Bangladesh have already expanded their required lifestyle. And, a private car is a now a necessity of each middle-class family rather than the lifestyle. Around 65 cars are being sold every day in Bangladesh now which is the highest in the country's history. Cars are the major emitter of CO₂ which stake about 59% of total emission from road transportation. This is followed by motor cycles which contribute about 11% to total emission. This indicates that private transportation is the major sources of CO₂ emission from road transportation. It has already been mentioned that the country experienced unprecedented growth of private cars in last several years. It has been projected that it will boom further in the coming years. Therefore, the major challenge of GHG reduction in transportation sector of Bangladesh is to control emissions from private vehicles. Moving forward, not only private cars are causing harm to environment but also other vehicle are taking place everyday life to emitting GHG which is understood by following data of vehicle enrolment by BRTA.

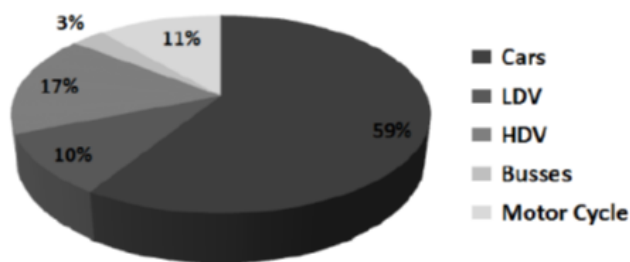


Fig. 3. Contributions of different road vehicles in CO2 emission [7].

V. CONCLUSION

In conclusion, we can say that transportation is the backbone of economic development of any nation. Efficient mobility enhances productivity and encourages economic activity; thereby increase national production and competitiveness. At the same time, transport has fundamental impacts on both built-up and natural environment. The issue of GHG emission from transportation has become a major concern across the world in the context of climate change. Interactions between different technical and non-technical measures with CO₂ emission are non-linear and often complex. Sophisticated modelling tools system dynamics and various soft computing techniques can be employed for reliable simulation of CO₂ emissions. Reduction of CO₂ emissions especially from transportation is a very broad and disputed issue. Numerous technical and non-technical measures have been proposed, evaluated and implemented in this regard in various geographical regions. The present study discussed only few widely used measures and their applicability in Bangladesh. Further studies can be carried out in future to identify more suitable but effective options for CO₂ emission reduction from transportation sector in Bangladesh. Mostly qualitative analysis of data is conducted to carry out this case study.

REFERENCES

- [1] Shamsuddin Shahida, Anil Minhasb, Othman Che Puanb, Assessment of Greenhouse Gas Emission Reduction Measures in Transportation Sector of Malaysia.
- [2] Aziz, A. B. A and Amin, N. F. M. 2012. Transforming the Land Public Transport System in Malaysia: Transforming the Land Public Transport System in Malaysia. JOURNEYS. (May): 30–37.
- [3] IPCC. 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE (Ed) Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press: Cambridge.
- [4] Carbon footprint measurement report, 2014, Bangladesh Bank Head Quarter Motijheel, Dhaka, Bangladesh.
- [5] Barth, M., Boriboonsomsin, K. 2008. Real-world CO₂ impacts of traffic congestion. Tech. rep., Paper for the 87th Annual Meeting of Transportation Research Board.
- [6] Treiber et al. 2008. Treiber, Martin, Kesting, Arne, Thiemann, Christian, 2008. How Much does Traffic Congestion Increase Fuel Consumption and Emissions? Applying a Fuel Consumption Model to the NGSIM Trajectory Data, In: Paper Presented to the Annual Meeting of the Transportation Research Board.
- [7] Hosseini, S. E., Wahid, M. A., Aghili, N. 2013. The Scenario of Greenhouse Gases Reduction in Malaysia. Renewable and Sustainable Energy Reviews. 28: 400–409.
- [8] Wright, L.; Kemp, S.; Williams, I. (2011). "Carbon footprinting": towards a universally accepted definition". Carbon Management. 2(1): 61–72. doi:10.4155/CMT.10.39
- [9] http://www.carbontrust.co.uk/solutions/CarbonFootprinting/what_is_a_carbon_footprint.htm
- [10] <http://www.co2list.org/files/carbon.htm>
- [11] <https://www.thedailystar.net/frontpage/colossal-loss-1553002> (12:56 PM, March 25, 2018)
- [12] <https://knoema.com/atlas/Bangladesh/CO2-emissions-per-capita#>



INNO  **SPACE**
SJIF Scientific Journal Impact Factor

Impact Factor:
7.512

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details