

## Road Transport Scenario in Dhaka City and Air Pollution Aspects - A Comparative Analysis

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Presented by

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## Introduction

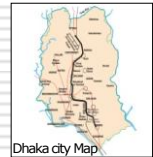
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- Dhaka ranked as the 10<sup>th</sup> most polluted city in the world posing serious health threats  
*(Economist Intelligence Unit, UK, 2010)*
  - The same study confirmed that nearly 6.1 lac children showing symptoms of asthma in Dhaka
  - Road transport is serving as the backbone to city commuters
  - More than 3,750 motorized vehicles hit the streets of Dhaka every month *(BRTA, 2010)*
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## Study Area

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- Dhaka Megacity.....
  - holds 40 percent of total urban population (14 million) within 360 sq.km
  - will be home for 20 million population by year 2025 with the current trend  
*(Shafi, 2010)*
  - has roads on only 8% of its landmass
  - turned into a concrete jungle experiencing rapid urbanization



## Have a gaze!



Rapid Urbanization



Growing number of private vehicles



Photo courtesy: The Daily Star

## Have a gaze!

### Air Pollution Hazard



In 1996-97, Lead (Pb) concentration level was reported as the highest in the world (Ahmed, 1997).

Photo courtesy: The Daily Star

## Literature Review

Table 1: Allowed concentration level set by WHO

Type of Pollutant	Acceptable limit ( $\mu\text{g}/\text{m}^3$ )
Particulate Matter	PM <sub>2.5</sub> 10 (annual mean)
	25 (24-hour mean)
PM <sub>10</sub>	20 (annual mean)
	50 (24-hour mean)
Ozone (O <sub>3</sub> )	100 (8-hour mean)
Nitrogen dioxide (NO <sub>2</sub> )	40 (annual mean)
	200 (1-hour mean)
Sulfur dioxide (SO <sub>2</sub> )	20 (24-hour mean)
	500 (10-minute mean)

Source: WHO Air quality guidelines, 2005.

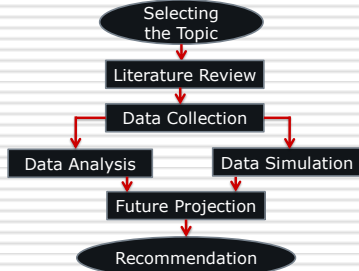
## Literature Review

Table 2: Updated (2005) ambient AQ standards (under AQM project)

Pollutant	Mean period	Bangladesh <sup>a</sup> standard ( $\mu\text{g}/\text{m}^3$ )	WHO <sup>b</sup> guideline value ( $\mu\text{g}/\text{m}^3$ )	US EPA <sup>d</sup> standard ( $\mu\text{g}/\text{m}^3$ )
CO	8-hour	10,000 (9 ppm)	10,000 <sup>c</sup>	10,000
	1-hour	40,000 (35 ppm)	30,000 <sup>c</sup>	40,000
Pb	annual	0.5	0.5	-
NO <sub>x</sub>	annual	100 (0.053 ppm)	-	-
TSP	8-hour	200	-	-
	annual	50	20	revoked
PM <sub>10</sub>	24-hour	150	50	150
	annual	15	10	15
PM <sub>2.5</sub>	24-hour	65	25	35
	1-hour	235 (0.12 ppm)	-	235
O <sub>3</sub>	8-hour	157 (0.08 ppm)	100	157
	annual	80 (0.03 ppm)	-	78
SO <sub>2</sub>	24-hour	365 (0.14 ppm)	20	365

Source: <sup>a</sup>S.R.O. No. 220-Law 2005; <sup>b</sup>WHO, 2005; <sup>c</sup>WHO, 2000 and <sup>d</sup>US EPA, 2006.

## Methodology



## Data Analysis & Facts

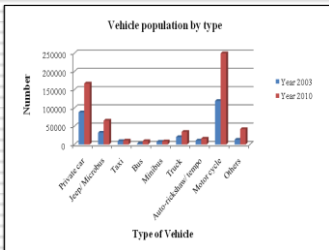
**Table 3: Statistics of registered vehicles**

Type of Vehicles	Up to 2003	2004	2005	2006	2007	2008	2009	2010	Grand Total
Private car	87866	4734	5633	7403	10244	13749	17654	19557	166840
Jeep/Microbus	32391	2114	3303	4548	4372	5077	6803	6687	65295
Taxi	9369	523	514	266	0	0	10	0	10682
Bus	2614	779	728	949	1082	1144	914	1101	9311
Minibus	7460	368	118	75	77	107	112	142	8459
Truck	20342	1437	1104	1480	830	1642	3180	4543	34558
Auto-rickshaw/ tempo	10687	2344	139	230	121	155	1144	1362	16182
Motor cycle	119299	7872	12879	16284	17303	23713	22093	30264	249707
Others	13187	1300	2361	2728	2913	2580	4868	12225	42132
<b>Total</b>	<b>303215</b>	<b>21471</b>	<b>26779</b>	<b>33963</b>	<b>36942</b>	<b>48137</b>	<b>56778</b>	<b>75881</b>	<b>603166</b>

Source: BRTA, 2010.

Only about 25-50% of the actual number of vehicle is registered (ICTP, 2001)

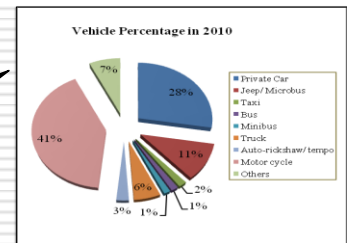
## Data Analysis & Facts



Almost doubled vehicle entered with the valid permission of BRTA

**Fig. 1:** Vehicle pop<sup>n</sup> comparison (2003 vs 2010)

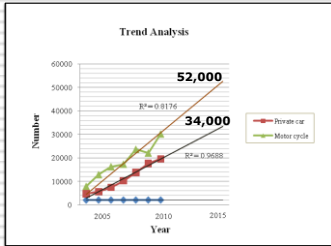
## Data Analysis & Facts



More than 75 percent of vehicles are directly contributing to air pollution.

**Fig 2:** Vehicle percentage in Year 2010

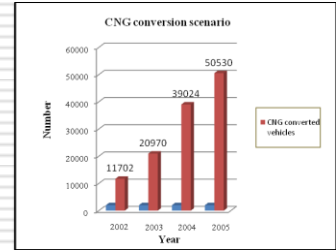
## Data Analysis & Facts



In 2010, the number of vehicles reached 7 times the capacity of the roads. (*The Daily Star, 2010*)

Fig. 3: Forecasted vehicles (2 types) by 2015

## Data Analysis & Facts

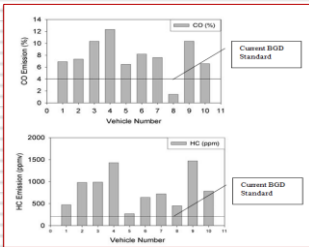


Nearly 1.5 lac old and junk vehicles are reported to be blamed for emitting thick black smoke (*The Daily Star, 2010*)

Fig. 4: Year wise CNG converted vehicles (nos.)

Source: SUEP, 2006.

## Data Analysis & Facts



- CO: 7-12 % (tolerable 4%)
- HC: 450 - 1472 ppm (approved 180 ppm)

- Lack of proper conversion skill
- Poor maintenance
- Lack of periodical maintenance

Fig. 5: Observed CO and HC emission from CNG vehicles

Source: SUEP, 2003.

## Data Analysis & Facts

Table 4: Veh pop<sup>a</sup>, annual utilization and fuel economy in Dhaka

Type of Vehicle	Vehicle Pop <sup>a</sup>	Annual Utilization (Km/yr)	Fuel Economy (Km/l)
Car & Taxi	42,000	19,200	8.0
Jeep & Microbus	12,000	19,200	8.0
Disel Bus	4,000	57,600	4.8
Disel Truck	5,000	64,000	2.4
3-Wheeler	14,500	38,400	2.4
2-Wheeler	73,500	10,000	35.0

Source: DUTP, 1996.

## Data Analysis & Facts

Motor vehicles annually emit...  
 PM<sub>10</sub> : 3,700 tons  
 NO<sub>x</sub> : 8,550 tons  
 CO<sub>2</sub> : 50,700 tons

In 1995, Bangladesh emitted 20 millions of tons CO (IEA, 1995)

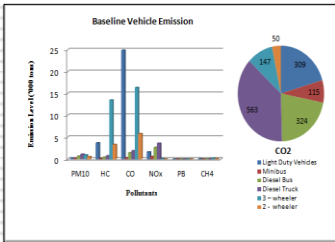


Fig. 6: Baseline emission inventory in Dhaka

Source: Working Paper No.23, GDMAITS (1996)

## Data Analysis & Facts

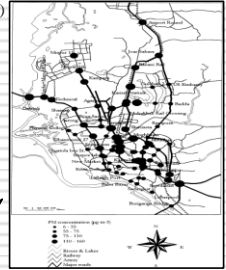
Table 5: PM concentration in Dhaka city (mcm)

Pollutant	Year 2003	Year 2004	Year 2008
PM <sub>10</sub>	330	238	291
PM <sub>2.5</sub>	266	147	191.83

Source: AQMP, 2008.

Recently the PM density has reached 247 mcm which is 5 times the acceptable level set by NAAQS (S.Khan, 2011)

Air pollution kills 15,000 Bangladeshis each year (World Bank Report, 2010)



Source: Karim, 1998.

Fig.7: PM concentration in the streets of Dhaka

## Projected Outcome

- Each year nearly 80,000 more vehicles are being added on the same infrastructure
- By 2015, the total number of vehicle will reach around 850,000

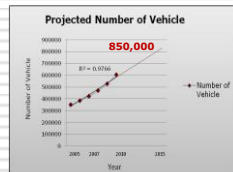


Fig. 8: Projected number of vehicle

## Projected Outcome

- By 2015, only around 180,000 vehicles will be under CNG operation

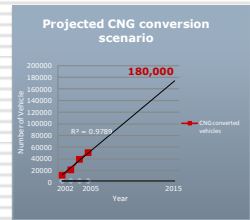


Fig. 9: Projected no. of CNG vehicles

- In 2016,  $PM_{10}$  and  $PM_{2.5}$  concentration will be appx. 18 and 24 times the acceptable level set by WHO

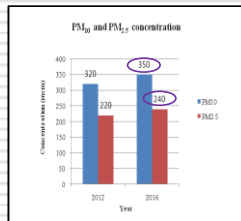


Fig. 10: Forecasted PM Concentration level

## Recommendation

- Appropriate transportation planning is to be adopted
- Old and worn-out vehicles have to be replaced
- Steps should be taken to reduce traffic congestions
- Rickshaws have to be gradually phased out

## Recommendation

- DoE and BRTA should enforce their regulations strictly
- Various authorities like DESA, DWASA, DoE, BRTA should be coordinated
- A "Dhaka Pollution Control Authority" should be established
- FM radio, TV channels and print media can play role to create public awareness

THANK YOU

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