

AIR QUALITY IMPACTS OF CNG FUEL SWITCH FOR VEHICLES IN CHITTAGONG, BANGLADESH



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Introduction

A large part of the vehicle fleet in Bangladesh is currently running on the clean fuel Compressed Natural Gas (CNG). However, CNG demand is high for all sectors in Bangladesh (including energy production) at a time when the CNG supply is static, and possibly decreasing.

There is the future potential of a vehicle fuel switch from CNG to petrol and diesel (such as in 2020). This study investigates the effects of such a fuel switch on air quality in Bangladesh's second largest city – Chittagong. This work is part of the BAPs (Bangladesh Air Pollution Studies) project Task 2 (Dispersion Modelling).

Methods

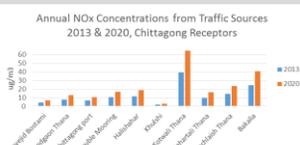
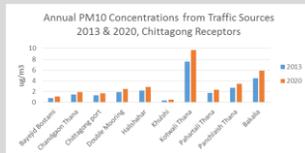
The AirQUIS model was used to compile a complete emission inventory for Chittagong (for all source sectors) and dispersion modelling was performed based on the inventory (using EPISODE within AirQUIS, 1x1km² resolution). The vehicle compositions based on fuel type for the 2013 baseline and 2020 scenario used in this study:

	Cars		Trucks		Busses	
	Baseline	2020	Baseline	2020	Baseline	2020
CNG	70%	0%	40%	0%	70%	0%
Petrol	20%	65%	0%	0%	0%	0%
Diesel	10%	35%	60%	100%	30%	100%

Baby taxis remained 100% CNG, while motorcycles remained 100% Petrol.

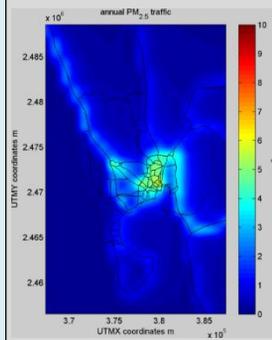
Results: Receptor Concentrations

Results show that the 2020 scenario increases annual average concentrations of PM₁₀ by 30%, PM_{2.5} by 40%, and NO_x by 60% for traffic sources alone at 10 receptor cells in the modelling grid for Chittagong.

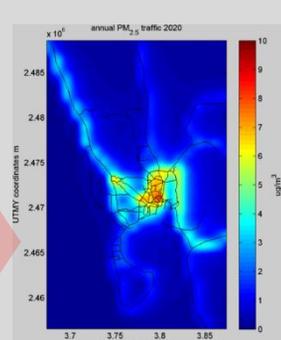


Results: PM_{2.5} Dispersion Models

2013 Baseline



2020 Projected

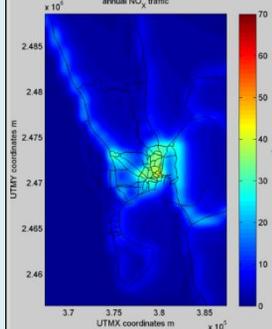


PM_{2.5} concentrations from traffic sources alone in Chittagong:

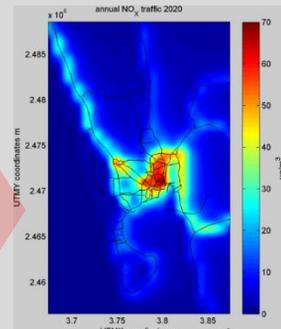
40% Increase in annual PM_{2.5} Concentrations at receptors after fuel switch

Results: NO_x Dispersion Models

2013 Baseline

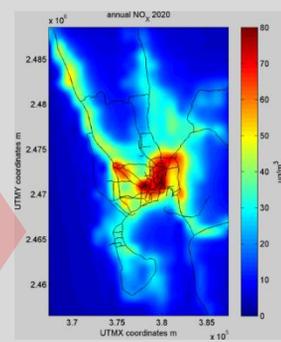
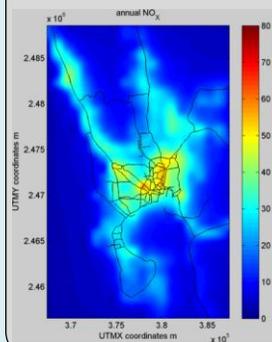


2020 Projected



NO_x concentrations from traffic sources alone in Chittagong:

60% Increase in annual NO_x Concentrations at receptors after fuel switch



NO_x concentrations from all sources in Chittagong:

30% Increase in annual ambient NO_x Concentrations at receptors after fuel switch

Conclusions

A possible fuel switch from CNG to petrol/diesel for vehicles in the near future in Bangladesh will have detrimental impacts to the ambient air quality. Of most concern is NO_x, where annual average ambient concentrations are modelled to **increase 30%** in Chittagong based on a pending fuel switch.

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