Recommendations Regarding Revisions to the
Bangladesh National Ambient Air Quality Standards

Introduction

The initial ambient air quality standards for Bangladesh are contained within the Environmental Conservation Rules, 1997. The air quality standards set under the ECR 1997 do not specify monitoring methods and frequency, averaging times, compliance requirements and other necessary factors. Moreover, in these standards, thoracic coarse and fine particulate matter (PM_{10} and $PM_{2.5}$, respectively) were not included. However, suspended particulate matter (SPM) was present in the old ambient air quality standard. It is now recognized that these standards require review to adjust with the new regulatory requirements.

The Air Quality Management Project (AQMP) implemented by the DoE during 2000-2007 with support from the World Bank was to initiate a comprehensive air quality management program in Bangladesh. The objectives of the AQMP included reducing vehicular emissions in the metropolitan areas, setting standards, enforcing pilot programs towards cleaner technologies, as well as implementing air quality monitoring and evaluation. This program led to the revision of the ambient air quality standards of Bangladesh in July 2005 (In the interim, there have been further modifications to air quality standards in other countries and thus, it is appropriate to reexamine the current NAAQS for Bangladesh to determine if additional changes are warranted.

Rationale for NAAQS

In the United States, the Clean Air Act as amended requires that the Environmental Protection Agency set ambient air quality standards for criteria pollutants to protect public health with an "adequate" margin of safety. Feasibility and cost cannot be a consideration in setting the standards as they are solely health based. In the absence of an analogous legislative driver, the Bangladesh government needs to determine its objectives in setting ambient air quality standards. Clearly Bangladesh citizens should be afforded the same level of health protection as the citizens of other countries. The current air quality in Bangladesh is often poor and it will take considerable resources and time will be required to bring air quality into alignment with stringent air quality standards such as were set in 2005. However, setting stringent standards that recognize the real threat to public health that diminished air quality represents is appropriate as well as putting into place an effective strategy to bring air quality to the desired level in an appropriate period of time. Thus, the setting of the standards is a policy decision and not one of science. Science can quantify the level of risk associated with any given concentration of each pollutant. The policy decision is what level of risk is acceptable at present and into the future.

Table 1) by adopting the United States Environmental Protection Agency's (US EPA's) National Ambient Air Quality Standards (NAAQS) as the ambient air quality standards for Bangladesh with minor modifications (more stringent standard for lead following WHO guideline). US EPA

standards include PM_{10} (particulate matter less than or equal 10 micron) matter and $PM_{2.5}$ (Particulate matter less than or equal 2.5 micron) in view of their severe health implications. The standards were adopted as *long term objectives* recognizing that meeting the standards in the short term would not be economically or practically feasible. It was also recommended that the GoB might develop air quality improvement action plans for areas where the standards are not satisfied.

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Table 1: Ambient national air quality standards ($\mu g/m^3$) in Bangladesh (2005) and comparison with neighboring countries including WHO and US

Pollutant	Averaging time	Bangladesh standard	India standard	Pakistan standard	Nepal standard	Thailand standard	US standard	WHO guideline
Carbon Monoxide (CO) (mg/m^3)	8 hour	10 (9 ppm)	2	5	10	10	10	10
	1 hour	40 (35 ppm)	4	10	100	35	40	30
Lead (Pb) ($\mu g/m^3$)	Annual	0.5	-	-	-	-	0.15	0.5
Oxides of Nitrogen (NO_x) ($\mu g/m^3$)	Annual	100 (0.053 ppm)	40	40	40	30	100	-
Suspended Particulate Matter (SPM)	8 hour	200	-	-	-	-	-	-
Coarse	Annual	50	60	120	-	-	-	20

Pollutant	Averaging time	Bangladesh standard	India standard	Pakistan standard	Nepal standard	Thailand standard	US standard	WHO guideline
Particulates (PM_{10}) ($\mu g/m^3$)	24 hour	150	100	150	120	120	150	50
Fine Particulates ($PM_{2.5}$) ($\mu g/m^3$)	Annual	15	40	15	-	25	15	10
	24 hour	65	60	35	-	50	35	25
Ozone (O_3) ($\mu g/m^3$)	1 hour	235 (0.12ppm)	100	-	-	70	235	-
	8 hour	157 (0.08ppm)	180	130	-	100	157	100
Sulfur dioxide (SO_2) ($\mu g/m^3$)	Annual	80 (0.03ppm)	50	80	50	40	78	-
	24 hour	365 (0.14ppm)	80	120	70	120	365	20

Current data suggests that the only problematic pollutants are $PM_{2.5}$ and PM_{10}. However, the lack of violations of the ozone standard is more likely a function of the location of the sampling sites. They are all in high traffic, urban locations where the emitted NO titrates the ozone to low concentrations. In the US, the siting criteria would avoid such locations in order to provide a more accurate estimation of the likely ozone concentrations.

In terms of the current standards, the listed species for oxides of nitrogen is NO_x (the sum of NO and NO_2). The corresponding indicator species in the United States is NO_2. Given the location of the sampling sites so that much of the NO is not converted to NO_2 by reaction with O_3, it is more sensible to leave NO_x as the indicator.

The only standard I would see changing at this point would be the lead standard level that should be revised to 0.15 $\mu g/m^3$. There is sufficient evidence of neurological harm at levels higher than this to justify the lower value particularly to protect more susceptible children.

Recommended revision

AIR POLLUTANT	EXISTING STANDARDS	AVERAGEING TIME	SUGGESTED RVISION	AVERAGEING TIME
1	2	3	4	5
Carbon Monoxide (CO)	10 mg/m^3 (9 ppm) (Ka)	8-hour	Unchanged	Unchanged
	40 mg/m^3 (35 ppm) (Ka)	1-hour	Unchanged	Unchanged
Lead (Pb)	0.5 $\mu g/m^3$	Annual	0.15	Annual
Oxides of Nitrogen (NO_x)	100 $\mu g/m^3$ (0.053 ppm)	Annual	Unchanged	Unchanged
Suspended Particulate Matter (SPM)	200 $\mu g/m^3$	8-hour	Unchanged	Unchanged
PM_{10}	50 $\mu g/m^3$ (Kha)	Annual	Unchanged	Unchanged
	150 $\mu g/m^3$ (Ga)	24-hour	Unchanged	Unchanged

$PM_{2.5}$	15 µg/m^3	Annual	Unchanged	Unchanged
	65 µg/m^3	24-hour	Unchanged	Unchanged
Ozone (O_3)	235 µg/m^3 (0.12 ppm) (Gha)	1-hour	Unchanged	Unchanged
	157 µg/m^3 (0.08 ppm)	8-hour	Unchanged	Unchanged
Sulfur di Oxide (SO_2)	80 µg/m^3 (0.03 ppm)	Annual	Unchanged	Unchanged
	365 µg/m^3 (0.14 ppm) (Ka)	24-hour	Unchanged	Unchanged

Abbreviation:

ppm : Parts Per Million

Notes: *In this schedule Air Quality Standards means Ambient Air Quality Standards

(Ka) Not to be exceeded more than once per year

(Kha) Annual average value will be less than or equal to 50 microgram/cubic meter

(Ga) Average value of 24 hours will be less or equal to 150 microgram/cubic meter for one day each year.

(Gha) Maximum average value for every one hour each year will be equal or less than 0.12 ppm. “