Malé Declaration - UNEP

Data Reporting

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MAY 2013

Lay Out of the Draft Report

(2009-2011)

- **Chapter 1 : Introduction**
- **Chapter 2 : Monitoring Program**
- **Chapter 3 : Results**
- **Conclusions**
- **Recommendations**

Chapter 1 Introduction

1.1 Background and Objective

- Introducing the Malé Declaration and its objectives
- Global and Regional concerns of Air Pollution

1.2 Air Quality in Asian Cities

- Sources of Air Pollution
- Types of pollutants

Chapter 2 Monitoring Program

2.1 The Malé Network monitoring programme

2.2 Parameters and Methodologies

2.3 Monitoring Locations

Chapter 3 Results

- **AQ Standards**

(WHO and country standards where available**)**

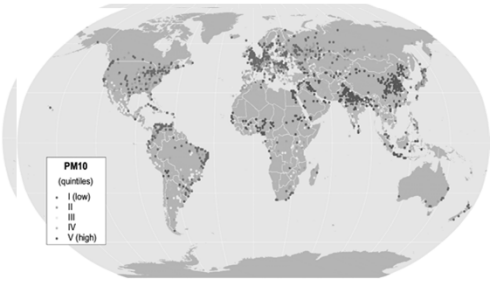
- **QA/QC**

- **Countrywise Data Analysis**

Countries Participating

- Bangladesh
- Bhutan
- India
- Iran
- Maldives
- Nepal
- Pakistan
- Sri Lanka

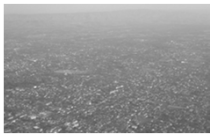
Air Quality in Asian Cities



Asian cities are exposed to PM10, which is relatively higher than other cities in the world. Sumber:Cohen **et. al. 2005**

Main Driving Forces

- **Population growth and urbanization**

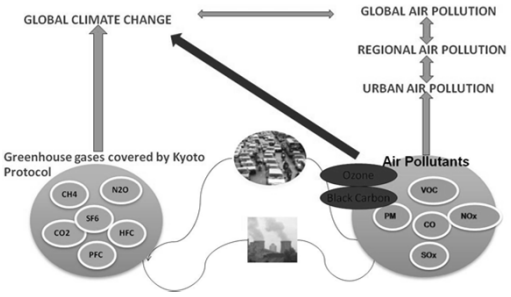


- **Economic development**

Global Concerns

- **Climate Change**
- **Ozone depletion**
- **Acid Rain**

Co-benefits: GHGs and Air Pollutant Reduction



Sources of Air Pollution

- Industry

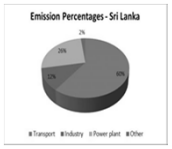
- Open burning of Garbage

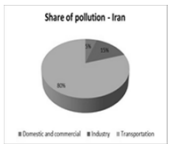
- Agricultural residue burning in fields

Sources of Air Pollution

- Vehicular Pollution – a major source in most of the countries, e.g.,

Sri Lanka





Iran

Monitoring Locations

- Bangladesh – Rural – Kulna
- Bhutan – Remote - Gelephu or Thimphu
- India – Rural - Port Canning
- Iran – Rural – Chamsari
- Maldives – Remote – Hanimaadhoo
- Nepal – Rural – Rampur
- Pakistan – Rural – Bahawalnagar
- Sri Lanka – Rural - Doramadalawa

AAQ Standards

Country	PM_{10}		$PM_{2.5}$		SO_2		NO_2		O_3	
	24 hrs	Annual	24 hrs	Annual	24hrs	Annual	24hrs	Annual	1hr	8hrs
WHO	50	20	25	10	20	--	--	40	--	100
Bangladesh	150	50	65	15	365	80	--	100	235	157
		60* 120**								
India(residential, rural and other areas)	100	60	60	40	80	50 20***	80	40 30***	180	100
Iran										
Nepal	120				70	50	80	40		
Pakistan										
Sri Lanka	100	50	50	25	120	80	100		200	

Status of Data Reporting

S. No	Country	Year	Months	Parameters
1	Bangladesh	2009	Jan - Dec	PM_{10}, SPM[1]
		2010	Jan - Dec	PM_{10}
		2011	Jan - Dec	PM_{10}
2		2009	Feb-July , Dec	PM_{10}
		2010	Jan –Oct,Dec	PM_{10}
		2011	Jan-Jun ,Oct – Dec	PM_{10}
3	India		--	--
4	Maldives		--	--
5	Nepal	2009	Jun-Aug, Nov, Dec	PM_{10}
6	Pakistan		--	--
7	Sri Lanka	2009	--	--
		2010	Jan - Dec	PM_{10}
		2011	Jan - Dec	PM_{10}
8	Iran	2009	Jan - Dec	PM_{10} SPM
		2010	Jan –Sep, Dec	PM_{10} SPM
		2011	Jan – Jul	PM_{10} SPM

passive

S. No	Country	Year	Months	Parameters
1	Bangladesh	2009	Jan - Dec	SO_2,NO_2,O_3
		2010	Jan - Apr	SO_2,NO_2,O_3
2		2009	Bhur: Feb – Dec Sorpang Dzong : Jan – Mar, May – Nov	SO_2,NO_2,O_3
		2010	Bhur : Jan – May	SO_2,NO_2,O_3
3	India		--	--
4	Iran	2009	Jan - Dec	SO_2,NO_2,O_3
		2010	Jan (15 days)	SO_2,NO_2,O_3
5	Maldives	2009	Jan – Nov	SO_2,NO_2,O_3
6	Nepal	2009	Jan - Dec	SO_2,NO_2,O_3
		2010	Jan , Feb	SO_2,NO_2,O_3
7	Pakistan		--	--
8	Sri Lanka	2009	Dutturewa: Jan - Aug, Nov, Dec	SO_2,NO_2,O_3
		2010	Dutturewa: Feb	SO_2,NO_2,O_3
		2009	Doramadalawa : Jan - Aug, Nov, Dec	SO_2,NO_2,O_3
		2010	Doramadalawa: Jan – Feb	SO_2,NO_2,O_3

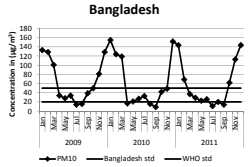
Wet (W)

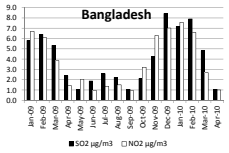
S. No	Country	Y	Months	Parameters
1	Bangladesh	2009	May-Sep	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2010	Apr-Aug	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
2	Bhutan		--	--
3	India		--	--
4	Maldives		--	--
5	Nepal		--	--
6	Pakistan		--	--
7	Sri Lanka	2010	Jan, Mar - May,Jul, Sep-Dec	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2011	Jan-Mar,May,Aug	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
8	Iran		--	--

Wet (B)

S. No	Country	Year	Months	Parameters
1	Bangladesh	2009	May - Sep	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2010	Apr - Aug	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
2	Bhutan	2009	May – Sep, Nov	Ec, pH
		2010	Sep -Dec	Ec, pH
		2011	Jan – Sep	Ec, pH
3	India		--	--
4	Maldives		--	--
5	Nepal	2009	Feb-Dec	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2010	Jan-Oct	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2011	Apr-Dec	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
6	Pakistan		--	
7	Sri Lanka	2009	Mar-May , Aug,Oct-Dec	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2010	Jan,Mar-May,Sep-Nov	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2011	Aug,Oct-Dec	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
8	Iran	2009	Apr, Dec	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2010	Feb, Dec	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-
		2011	Jan, Feb	Ec, pH, NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+},SO_4^{2-}, Cl^-

Bangladesh





Sources of Pollution – B'desh

- Major source of PM10 : Brick Kilns using wood/low grade coal
- Manufacturing : October to March. Peak Dec/Jan
- Other Sources : Road dust, construction sites, industry

Monsoon : June to October
(some in March/April & Dec/Jan)
Predominant Wind direction : ??????

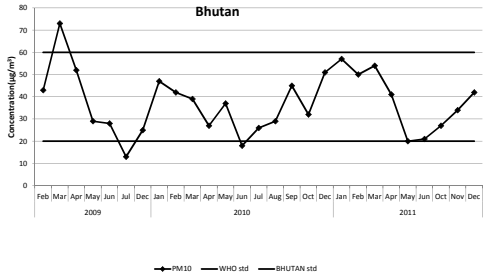
Wet(W) & Wet(B)

- Monitored for about six months in a year
- High conductance values correspond with the high concentration of sodium and chloride ions
- pH generally remains around 6
- No specific trends

Additional Information-B'desh

- General information of area/country
- Photographs brick kiln in operation – old/new technology
- Agriculture residue burning if there - period?
- Use of low quality diesel(freight vehicles not meeting standards) ?
- Can the results be correlated to emission inventory/other sources?
- Windrose/met data to be provided
- Map with emission sources(brick kilns) if possible
- SO_2 monitoring important in case coal is being used

Bhutan



Sources of Pollution -Bhutan

Major Sources :

- industrialization,
- rapid urbanization,
- Emission from motor vehicles
- loss of vegetation to infrastructure development,
- forest fires

Monsoon : May to September
Windy-Dusty : March to May

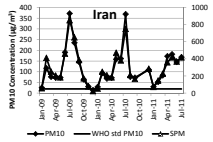
Additional Information-Bhutan

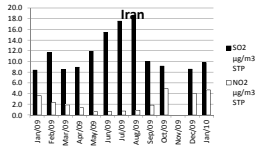
- Gelephu or Thimpu – location ?
- General information of area/country
- Discarded stray values e.g., 663/425/352(µg m3) for calculating average(– may be there is an explanation)
- Major crop – maize/rice – residue burning/months?
- Status of freight (trans border trade) ?
- Windrose/met data
- Low pH in precipitation– probable cause ?
- Tenfold increase in EC in 2010? – reason(calculation?)
- Windrose/met data to be provided

India

Data to be received

Iran





Sources of Pollution - Iran

Major Sources

- Vehicular Emissions
- large and small industrial processes.
- Power Refinery and petrochemical industries. plant industries
- Oil Wells ?
- **Dust Storms** ⟹

Driest months : July to September
Wettest month: January

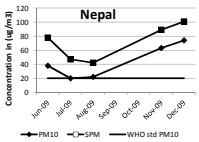
Additional Information - Iran

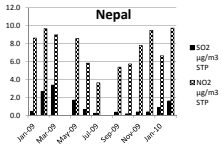
- General information of area/country
- Activities in Chamsari and Dehlaran(40km)
- Predominant wind direction
- Monsoon pattern
- Sources of PM10 other than natural
- Reasons for exceptionally high results not always given (discarded very high values- PM10 above 600; SPM above
- The oil wells of Iraq are 12-15km from the site(continuous flare reported)-do they influence the results ?
- Has the PM10/SPM been analysed at any time
- Correlation to emission inventory
- Windrose/met data

Maldives

Data to be received
(except some of diffusive for 2009)

Nepal





Sources of Pollution -Nepal

Major Sources

- Forest Fires
- Vehicular emissions ?
- Construction activity
- Agricultural residue burning – Nov-Dec & April-May
- Industry – Distillery, pharmaceutical, animal feed

Monsoon : End of June to September(80% of total rainfall)

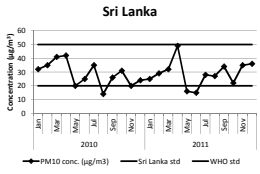
Additional Information - Nepal

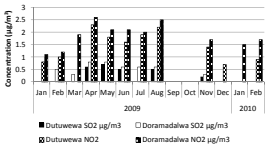
- General information of area/country
- Correlation to emission inventory
- Windrose/met data

Pakistan

Data to be Received

Sri Lanka





Sources of Pollution – Sri Lanka

- Vehicular Emissions
- Agriculture Residue Burning
- Construction Activities

Additional Information – Sri Lanka

- Activities in the area
- Anuradhapura activities – emission sources – transport – etc
- Tourism months ?
- Villages around the site – population/activity?
- Month with maximum agricultural residue burning in fields
- How far are the highways
- Met data during sampling days ?
- Dec PPT – PM2.5 measurement –location ?

Major Sources

- Vehicular Emissions
- Tourism?
- Agricultural Residue burning
- Construction Activities

Monsoon months :

Wind direction: SW from May to Sept. and NE from Dec. to Feb.

Additional Information/clarification

- Activities in the area
- Anuradhapura activities – emission sources – transport – etc
- Tourism months ?
- Villages around the site ?
- Month with maximum agricultural residue burning in fields
- How far are the highways
- Met data during sampling days ?
- Dec PPT – PM2.5 measurement –location ?

Limitations

- **Insufficient Data –e.g., only a few days in a month / a few months in a year**
- **Remarks related to site conditions not given to explain the odd/exceptionally high results**
- **Field blanks not being run in parallel or not being run.**
- **Very high values of field blanks.**
- **Contamination of field blank.**
- **Improper labeling of samples.**
- **Samples sent to IVL after long gaps.**
- **Temperature generally missing**
- **Frequency 24 hrs to three months exposure.**
- **Results and trends not correlated to sources of emission/emission inventory**

Recommendations

- Activities in and around monitoring location
- General information on sources of Air Pollution in the country
- Correlation to meteorological data
- Correlation of data generated by different methods or from other monitoring locations
- Correlation with emission sources
- Explaining trends if any
- Discarding/explaining stray values
- Regular monitoring

Thank You