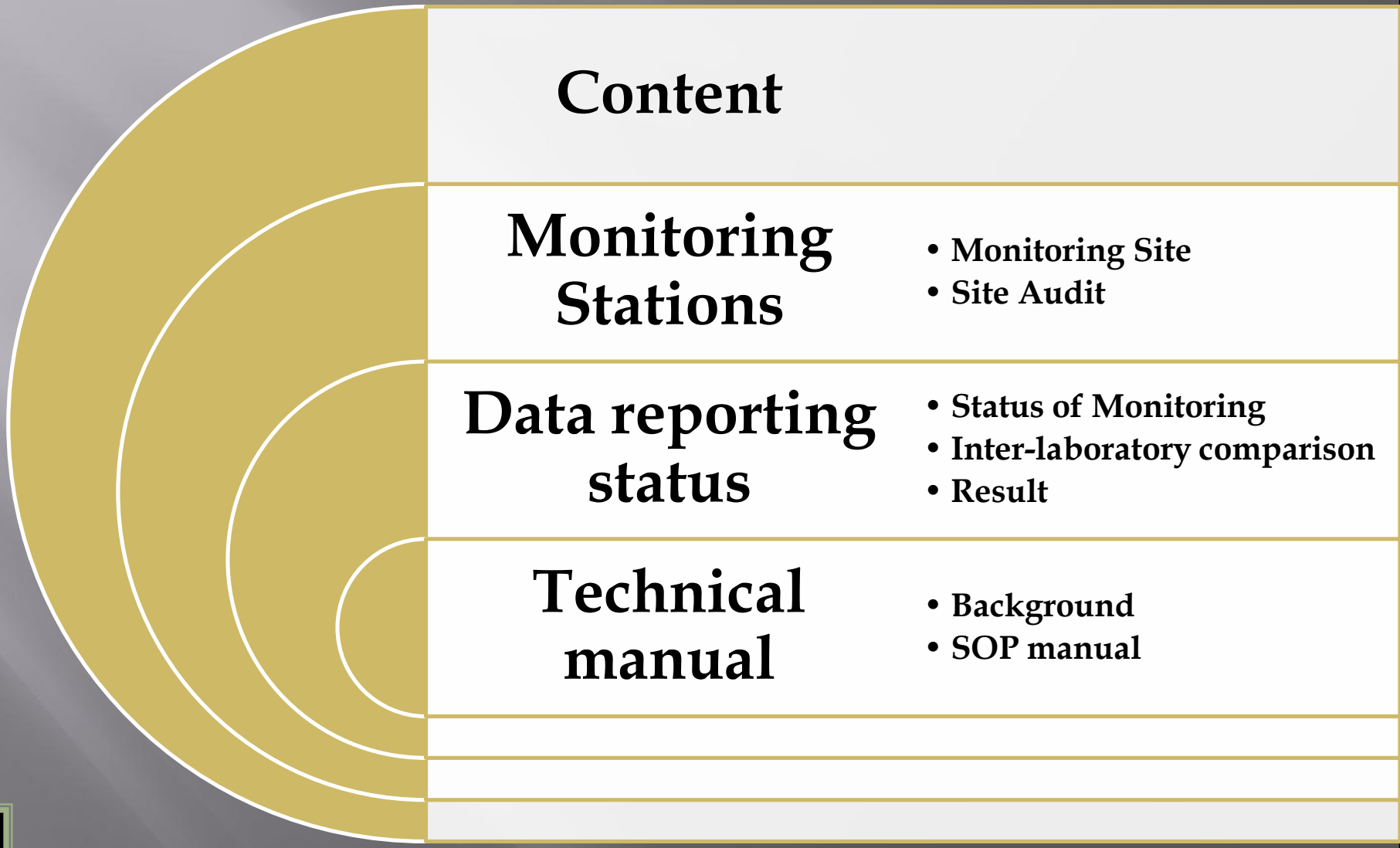
The Malé Declaration

Monitoring and Data reporting 2008/09

Monitoring and Data reporting under 2008/09



Monitoring sites under Phase III

Country	Monitoring station (total 15 stations)
Bangladesh	1. Kulna
Bhutan	1. Gelephu,(near to India boarder) 2. Thimphu
India	1. Port Canning 2. Dawki in Meghalaya (bordering Bangladesh) 3. Lakshadweep islands (bordering Maldives) 4. Pathankot in Punjab (near Pakistan boarder) 5. Daranga, Baska District near Bhutan boarder
Iran	1. Chamsari (Ilam province) 2. Zahedan (near to the city)
Maldives	1. Hanimaahu
Nepal	1. Rampur
Pakistan	1. Bahaal Nagar
Sri Lanka	1. Dutuwewa 2. Haton place in the Central Province

Detail Monitoring Sites in India under MD

Station Name	State	Bordering	Operating since	Average annual rainfall	Site type	Latitude	Longitude
Dawki Terrace building, Dawki, Jantia Hills District	Meghalaya	Bangladesh	August 2009	--	R	$26^0 47´06˝$ N	$91^0 30´52˝$ E
Dera Baba Nanak	Punjab	Pakistan	August 2009	--	R	32° 1' 60 N	75° 1' 0 E
Lakshadweep	Lakshadweep	Maldives	Station commissioned and will start soon	10 - 40 mm	--	10° 00' N	73° 00' E
Daranga, Baska District	Assam	Bhutan	Mach 2009	--	R	26° 48' 0N	91° 31' 0E
Port Canning	West Bengal	Bangladsh	Restarted from November 2009	1640-2000 mm	R	22° 19' 8N	88° 40' 17E

Monitoring sites under Phase III

Status of New monitoring site

Equipment installation

- **Bhutan**
- **Sri Lanka**

- **India**

Passive sampler

New bulk collector

Wind monitor

Temperature

Whether station for Iran

Wet only collector

Monitoring sites Aduit

Site Audit

Bhutan	Gelephu	16-17 September 2006
Bangladesh	Kulna	4-5 May 2007
Nepal	Rampur	10-11 May 2007
Sri Lanka	Mihintale	13-14 June 2007
Maldives	Hanimaadhu	4-5 October 2007
Iran	Chamsari	22-27 June 2008
Pakistan	Bahawal Nagar	17-18 October 2008
India	Port Canning	8 December 2008

Status of Monitoring under Phase III

1. Wet Deposition Monitoring,
2. Dry Monitoring, and
3. Collection of Meteorological data

1. Wet Deposition Monitoring

All countries report Wet monitoring data

Note: India and Maldives wet data (not in data analysis report)

A flow chart for sampling and analysis of the wet deposition samples

Wet deposition monitoring 2008/09

Sampling Frequency for Wet Deposition Monitoring using Wet only and Bulk collector

S No	Country	Name of site	Characteristics of sites	Sampling Interval	Sampling Months
1	Bangladesh	Kaikhali Forest station, Shamnagar, Satkhira	Remote	Daily	2004: Jul, Oct 2005: Aug, Sep, Oct 2006: Apr, Jun, 2007: May, Jul, Aug 2008-2009 regularly
2	Bhutan	Bhur, Gelephu	Remote	Daily	2003: Jul, Aug, Sep, Dec 2004: Jan, Feb, Aug, Dec
3.	India	Port Canning	Rural	Random	2005: Oct, 2006: April, July, Aug 2007: May, June, July, Sept
4	Iran	Chamsari, Ilam	Remote	Weekly	2004: Nov, Dec 2005: Jan, Nov, Dec 2006: Jan, Feb, Oct, Nov, Dec 2007: Jan, Feb, 2008-09- time to time
5	Sri Lanka	Dutuwewa	Remote	Weekly	2003: Nov, Dec 2004: Jan to Jul
6	Nepal	Rampur	Rural	Monthly	2006: Jul to Dec 2007: Jan to Aug
7	Pakistan	PBO Bahawal Nagar	Rural	Monthly	2007: all months (EC, pH only) 2008:Jan
8	Maldives	MCOH, Hanimaadhu	Remote	Monthly	2005: Jun, Jul, Aug, Sept, Dec 2006: Jan, July, Aug, Sept, Oct, Nov, Dec 2007: Jan

Dry Monitoring 2008/09

a) **High Volume Samplers (HVS) (PM10 and SPM)**
b) **Diffusive (Passive) sampler (SO_2, NO_2 and Ozone)**

S.No	Method	Duration/Frequency	Parameters
1	Diffuse(Passive) Sampling	Monthly composite	Concentration of SO_2, NO_2,and O_3
2	Air concentration Sampling(Using High Volume samplers)	24hr composite(consisting of two samples – 9am to 9pm and 9pm to 9am)To be carried out for 10days in a month between 5^{th} and 25^{th} of each month	Concentration of PM_{10}, NRSPM, TSPM

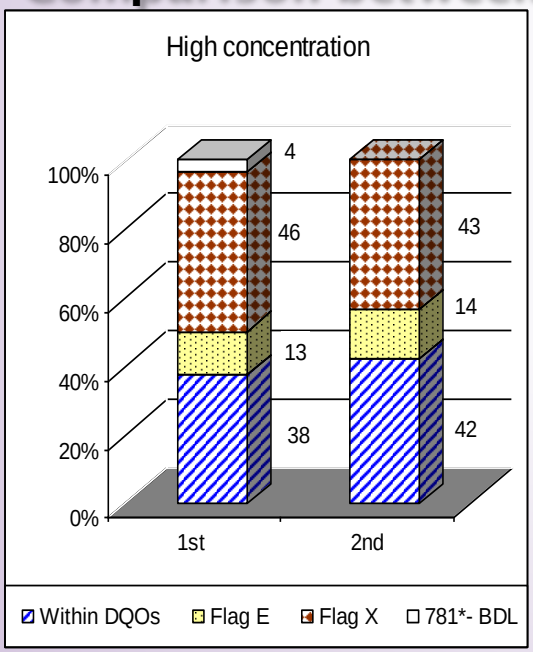
Need consistent exposure in monitoring of Passive samplers

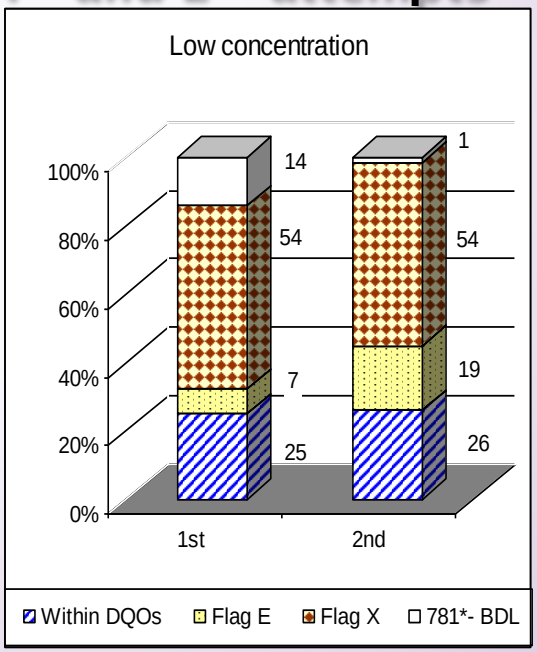
Inter- Laboratory Comparison under Phase III

Objectives of inter-lab comparison

- **To recognize the analytical precision and accuracy of the data by the participating laboratories (NIA)**
- **To provide an opportunity to improve data reliability/quality**

Comparison between 1st and 2nd attempts



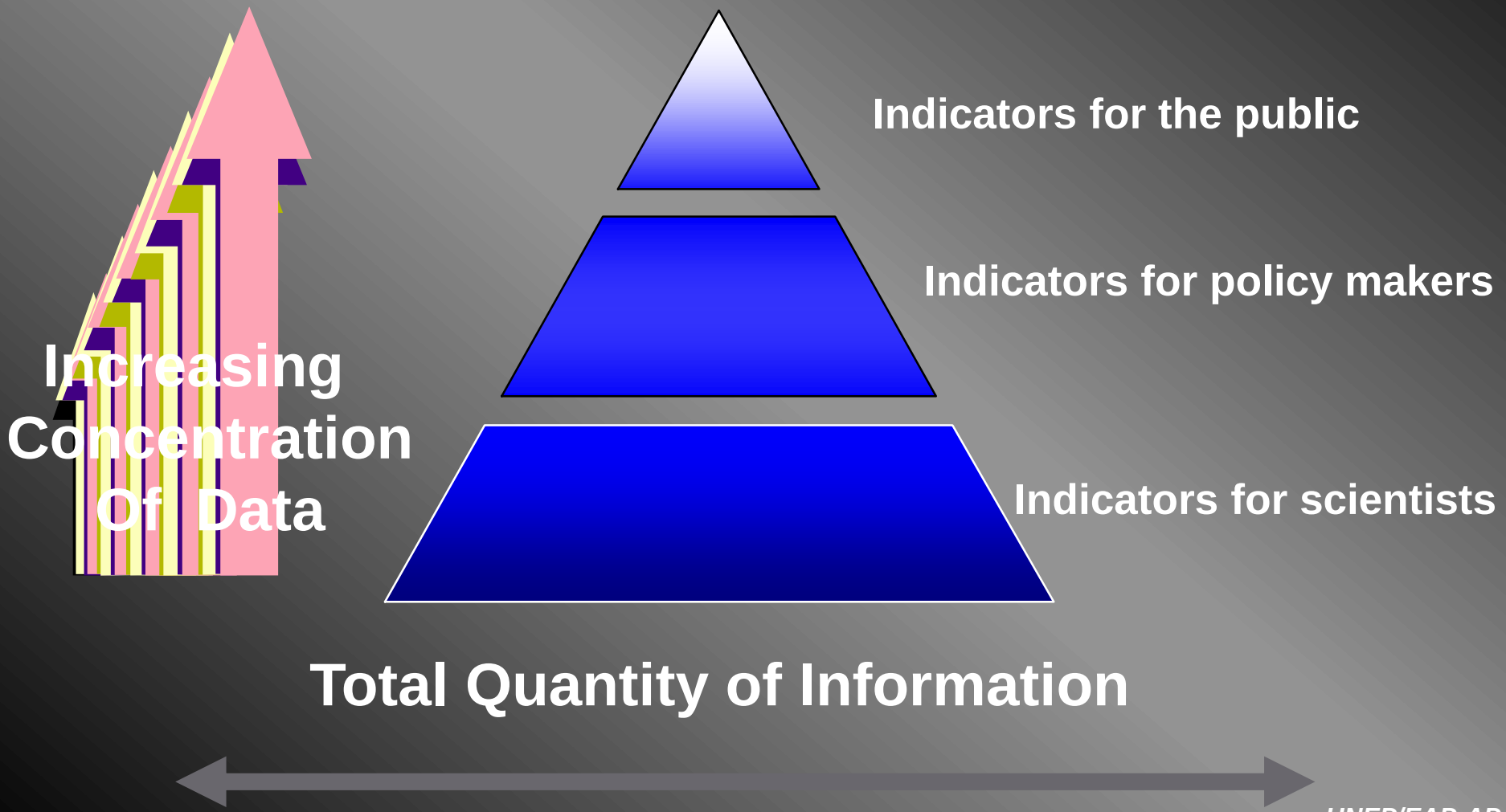


Inter- Laboratory Comparison under Phase III

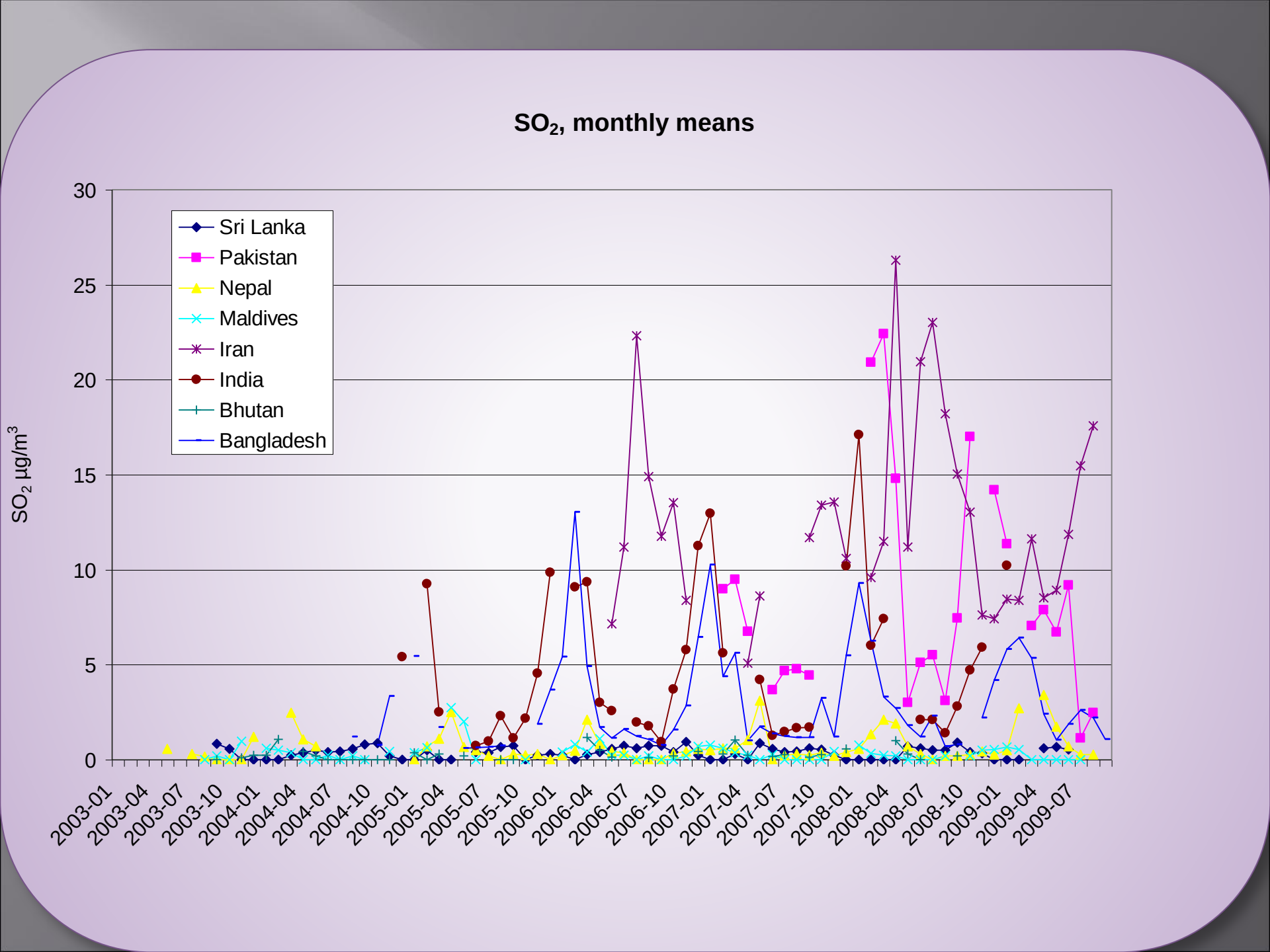
Summary remarks

- Strong bias for most of parameters, especially for low conc. sample (less than 1st attempt)
- Results of parameters requiring less sample treatment are more accurate (EC, pH)
- Larger number of reported data (56 in 1st attempt vs. 69 in 2nd)
- DL provided by most labs in reports of 2nd attempt (none was reported in 1st attempt)
- Less BDL data (1 in M22)
- 5 Labs have enough data points for R1 and R2 calculation, one submitted the R1 and R2 (vs. none in 1st attempt)

DATA, INFORMATION & INDICATORS RELATIONSHIP



(Source: After Braat, in Kuik & Verbruggen, 1991)


SO2, monthly means
SO2 µg/m3
30
25
20
15
10
5
0
Sri Lanka
Pakistan
Nepal
Maldives
Iran
India
Bhutan
Bangladesh
2003-01
2003-04
2003-07
2003-10
2004-01
2004-04
2004-07
2004-10
2005-01
2005-04
2005-07
2005-10
2006-01
2006-04
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2006-10
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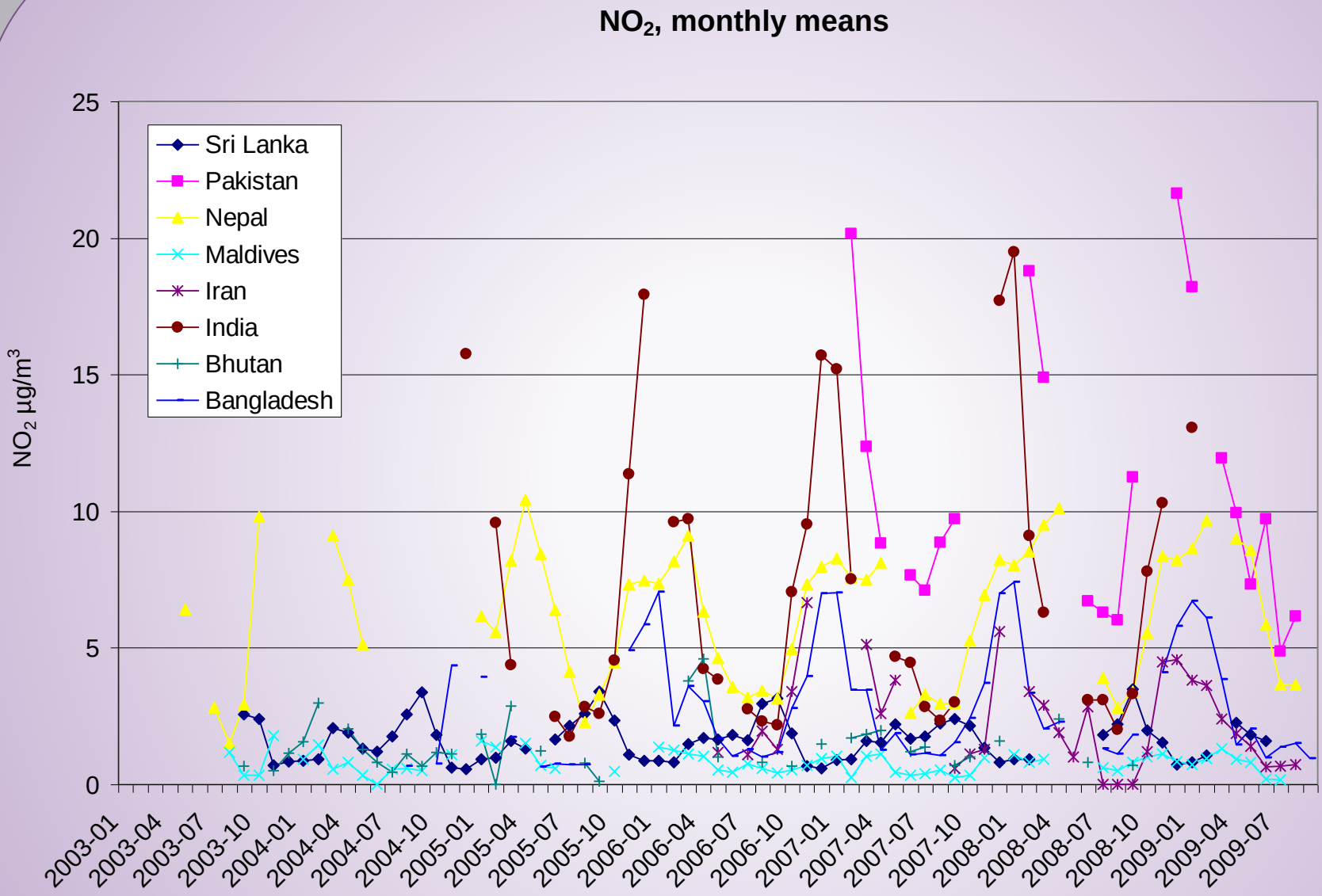
2009-04
2009-07


NO2, monthly means
NO2 µg/m3
25
20
15
10
5
0
Sri Lanka
Pakistan
Nepal
Maldives
Iran
India
Bhutan
Bangladesh
2003-01
2003-04
2003-07
2003-10
2004-01
2004-04
2004-07
2004-10
2005-01
2005-04
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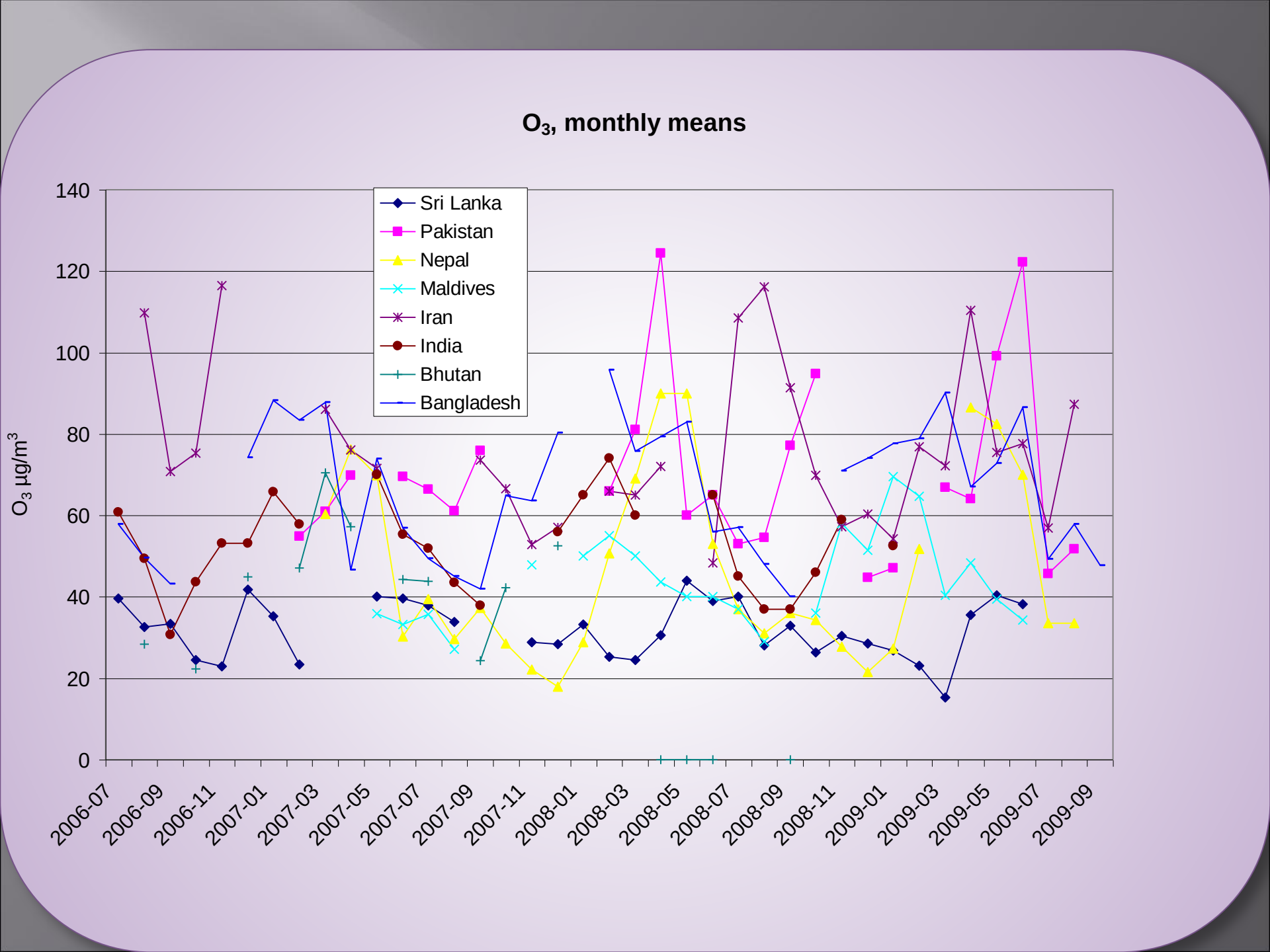
2009-01
2009-04
2009-07


O3, monthly means
O3 µg/m3
140
120
100
80
60
40
20
0
Sri Lanka
Pakistan
Nepal
Maldives
Iran
India
Bhutan
Bangladesh
2006-07
2006-09
2006-11
2007-01
2007-03
2007-05
2007-07
2007-09
2007-11
2008-01
2008-03
2008-05
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2009-09

CAD Inter-comparison of passive samplers for SO_2 and NO_2 measurements for the Malé Declaration

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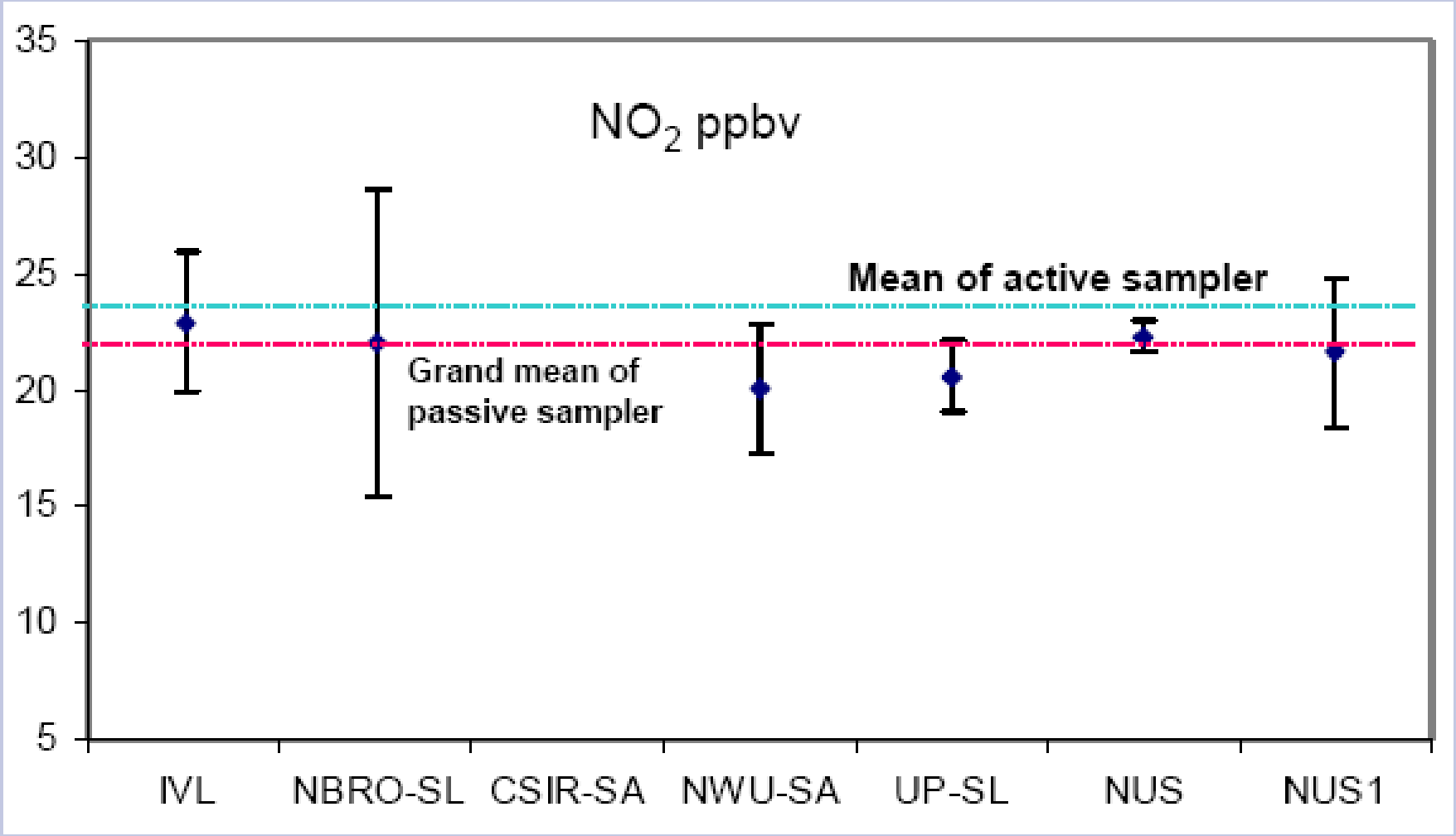

Recommendations for Malé Sites in Phases IV and V

Equipment used at Malé Sites

- In phase IV choose passive samplers for NO2, SO2 and O3 that can be constructed and analyzed in country by central laboratory/technical centre. These can be run in parallel with IVL samplers in PIV with intention that use of IVL samplers is phased out by PV.

- Aim to replace PM measurement by HVS with more reliable method that does not rely on mains electricity (e.g. Battery operated Minivol samplers)

- Assess suitability of equipment used for wet deposition measurement

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Result of the Data under Phase III

General comments

- All the countries reported the results of ambient air sampling using diffuse/passive samplers
- In many cases the samplers are sent very late to IVL or incorrect labeling
- However, most of the countries seem to have become more familiar/comfortable with the entire monitoring procedure particularly since 2007 when most of the countries became regular in carrying out the sampling and reporting the result as per the required protocol
- The results indicates that most of the countries are as yet in the process of strengthening their monitoring and analytical capabilities.

QA/QC and Data Quality under Phase III

No data is better than Data of Unknown or Bad Quality

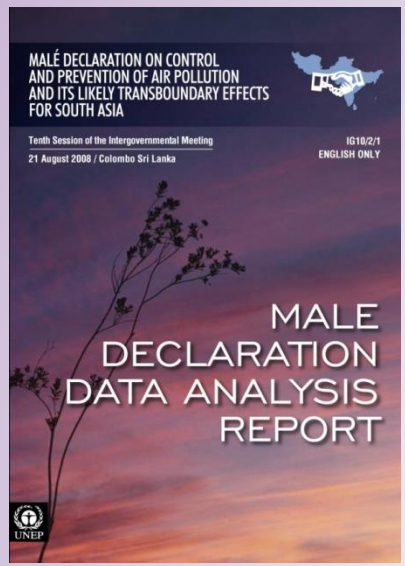
Technical Manual

Volume 1:	Introduction to the Malé Network monitoring programme
Volume 2:	Basic concepts
Volume 3:	Instruments and analytical methods for the field
Volume 4:	Instruments and analytical methods for the laboratory
Volume 5:	Data reporting procedure and format
Volume 6:	Quality assessment and quality control

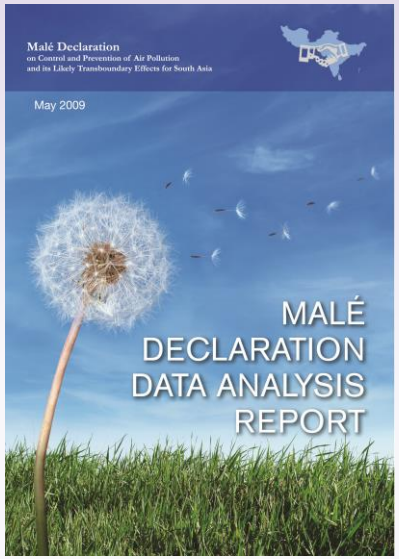
Standard operating manual

	Primary vols required	Secondary vols required
Field data collectors	3, 5	1, 2, 6
Laboratory scientists	4, 5, 6	1, 2
NIA managers	1, 5, 6	2, 3, 4

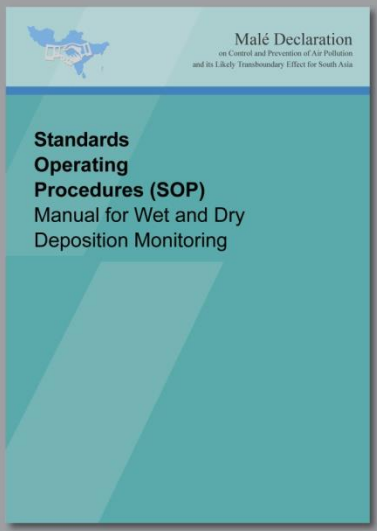
Monitoring Data Analysis Report



Final Data analysis report



Draft Standards Operating Procedures manual (Please give your comment by March 2010)



Male' Declaration Website

http://www.rrcap.unep.org/male/

QA/QC and Data Quality under Phase III

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Third attempt of Inter-laboratory comparison will start during Second quarter of 2010

THANK YOU