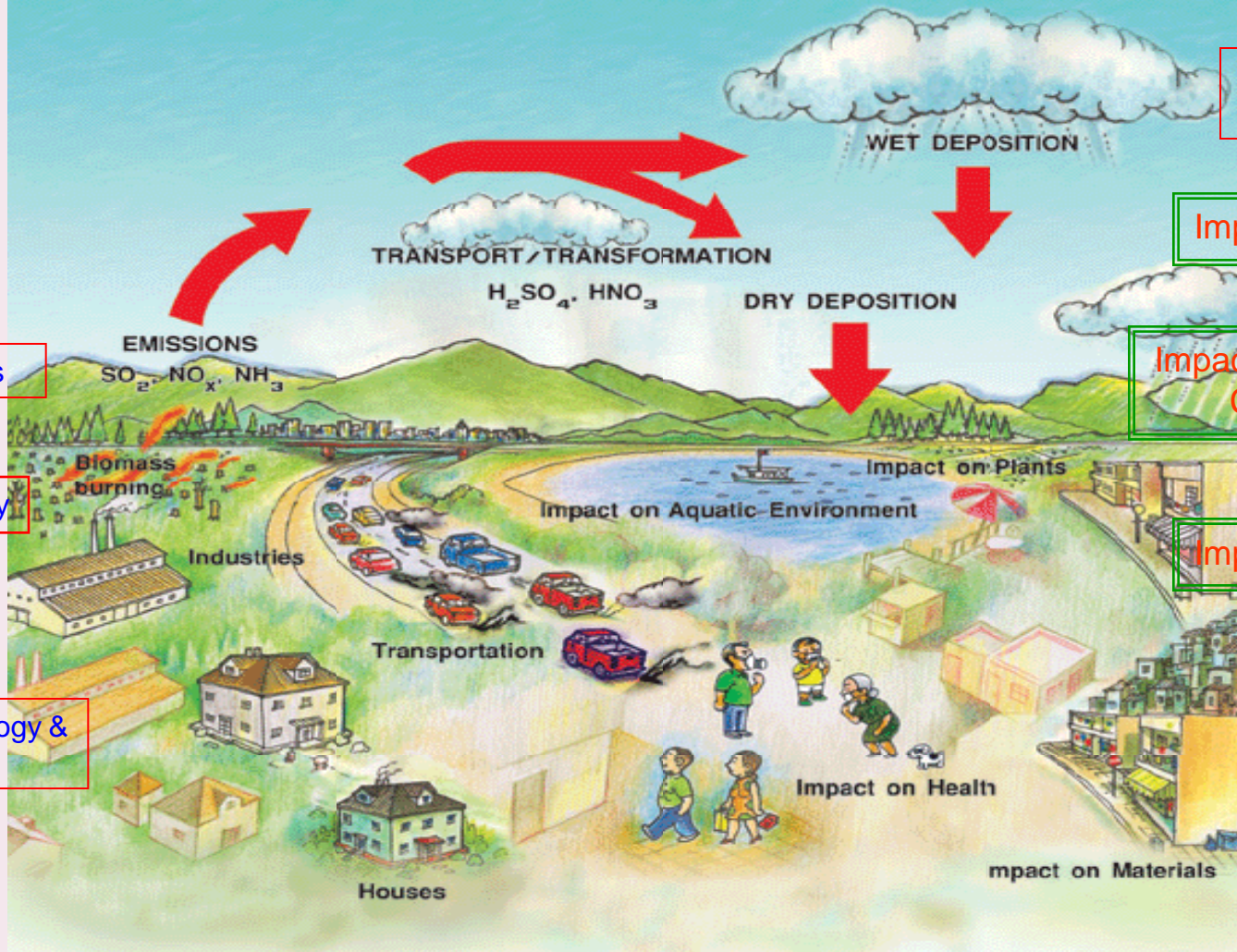


Presentation from India

**IMPLEMENTATION OF ACTIVITIES
UNDER MALÉ DECLARATION
ON CONTROL AND PREVENTION
OF AIR POLLUTION &
ITS LIKELY TRANS-BOUNDARY EFFECTS
FOR
SOUTH ASIA
November 18-19, 2010
New Delhi**

PREVENTION & CONTROL OF TRANS-BOUNDARY AIR POLLUTION

MECHANISM OF TRANSBOUNDARY AIR POLLUTION



Impact Assessment Studies

Impact on Crops

Impact on Materials Corrosion

Impact on Health

Modeling


Mass Awareness

Emission Inventory

Monitoring

Uniform Methodology & Quality Data

Presentation-Agenda

- Details of National Implementing Agency and Institutional Arrangement
 - Details of Monitoring Activities
 - Details of Stake-holder's participation
 - Data Completeness
 - Status of emission inventory and modeling
 - Status of impact assessment
 - Challenges and difficulties
- 

Institutional Arrangement

National Focal Point:

Ministry of Environment and Forests
Government of India

National Implementing Agency:

Central Pollution Control Board

Implementation Status (Phase-III)

S. No.	Activity	Summary Status
1	Ambient Air Quality Monitoring and wet deposition monitoring	<ul style="list-style-type: none">▪ Ambient air quality monitoring and wet deposition monitoring is being carried out at Sunderban bordering Bangladesh.▪ Three more stations added
2	Corrosion Study	<ul style="list-style-type: none">▪ Corrosion study is being carried out at TajMahal, Agra (only a study)
3	Health Impact Study	<ul style="list-style-type: none">▪ Study completed through Chittaranjan National Cancer Institute (CNCI), Kolkata.
4	Crop Impact Study	<ul style="list-style-type: none">▪ Study by Indian Agricultural Research Institute (IARI) on effect of ozone on crop is under progress

Implementation Status (Phase-III)

S. No.	Activity	Summary Status
5	Emission Inventory	<ul style="list-style-type: none"><li data-bbox="666 332 1522 375">▪ Emission inventory study completed
6	Advisory committee	<ul style="list-style-type: none"><li data-bbox="666 642 1821 735">▪ Advisory committee has been revised and its first meeting was organized in November 2009
7	Awareness	<ul style="list-style-type: none"><li data-bbox="666 952 1821 1096">▪ Data of Sunderban stations, information about Male' Declaration and link to Male' Declaration website have been provided on CPCB's website.

Additional Activities

- **Source Apportionment study (PM₁₀) in six cities**
 - **Source profile for vehicular sources**
 - **Source profiles for non-vehicular sources**
- **Revision of National Ambient Air Quality Standard (November 2009)**
 - Uniform ambient air quality for all (zones/areas)
 - Focus for criteria pollutants & health related parameters
 - Special norms for Ecologically sensitive areas
 - Consideration of health related parameters viz. PM_{2.5}, Benzene, Benzo(a)Pyrene.
 - Consideration of Signature metal analyses like Nickel, Arsenic and lead

Additional Activities (Contd.)

- **Preparation of Criteria for Comprehensive Environmental Assessment for Industrial Clusters (December 2009)**
 - Rational to characterize the environmental quality at a given location by means of algorithm of source, pathway and receptor for
 - Identification of problem areas action plan for prevention and control of pollution
 - Continual review
- **Development /Revision of Emission Standards**
 - Petroleum Oil Refinery
 - Common Incinerators
 - Sponge Iron Plants
 - Brick Kilns
 - Refractory Industries
 - Cashew Seed Processing Units
 - Sulphuric Acid Plants, etc.

Emission Inventory

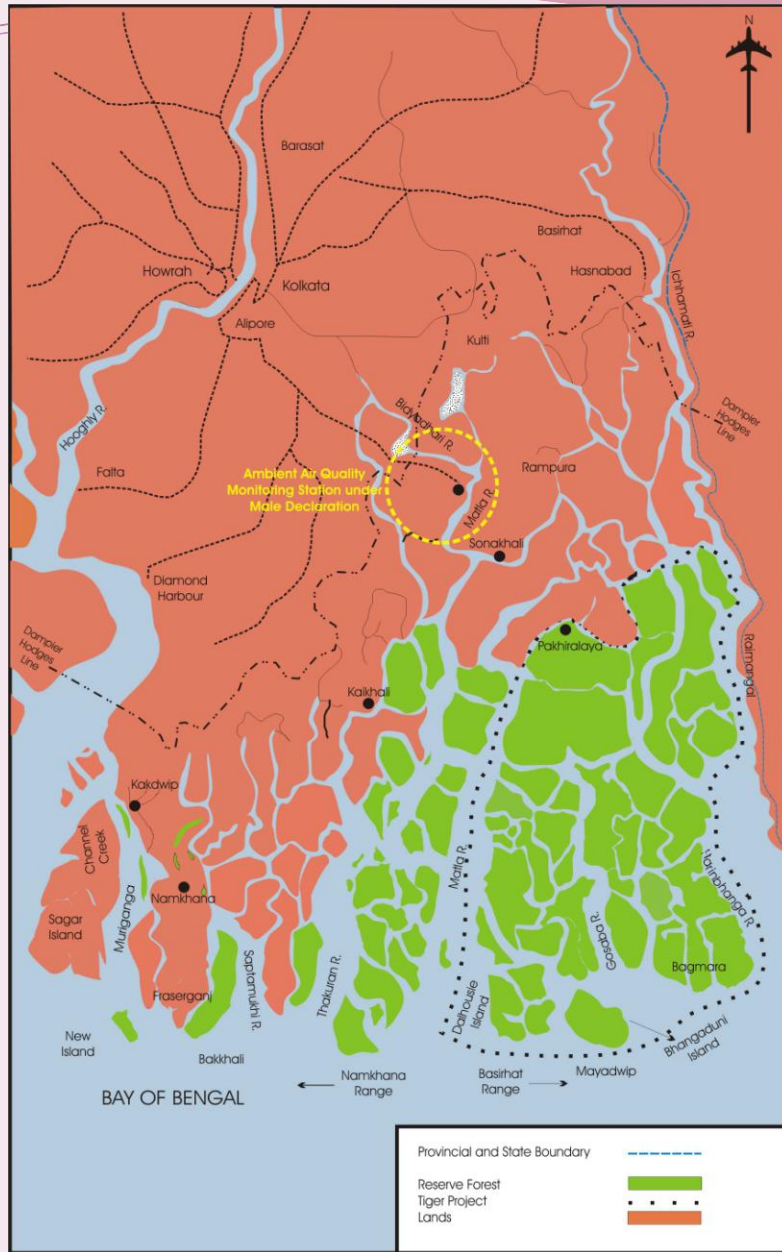
- Activity entitled, “National Level Inventory under Male’ Declaration” awarded to Indian Institute of Technology, Kanpur in September 2009 at cost of INR 7,59,572
- Under this exercise, the emission inventory study report has been prepared ‘region wise for the entire country’
- Methodology adopted is Male’ Emission Inventory Workbook Template (version 2.4) and manual as available at [www: rrcap.unep.org/md/male’](http://www.rrcap.unep.org/md/male') report
- Final report is being revised

Other Activities

- **The Seventh Regional Refresher Training Course for the participating countries was held in CPCB, New Delhi, India on 16 – 19 March, 2009.**
 - To strengthen the monitoring capacity.
 - To share and discuss the issue encountered in operating the monitoring station in each country.
 - To update the implementation activities under Male' Declaration in each country

Air Quality Monitoring at Canning

- About 70 km east of Kolkata city.
- Population of about 30,000 and is the main gateway to the Indian port of the Sunderbans mangrove forest
- A World Heritage site, hosts several rare and endangered flora and fauna including Royal Bengal tiger



Ambient Air Quality Monitoring Station Under Male Declaration

Land use of the monitoring area

- Bay of Bengal is at an aerial distance of about 40 km from Port Canning.
- River Matla located 0.5 km from the research station.
- Surrounded by agricultural field and a few isolated habitats.
- Surrounding areas with creeks with brackish water and mangrove forests.

Monitoring activities

- Monitoring of Ambient air at Port Canning started since September 2004
- Yearly monitoring of adjacent water bodies in and around the monitoring station
- Yearly assessment of soil/sediment in and around the area
- The meteorological data are collected regularly

Monitoring Result :Ambient Air Monitoring

- Ambient air monitoring eight hourly interval in a day for ten days in a month.
- RSPM values not exceeds during April to October
- Concentration of SO₂ and NO₂ level were always below the permissible standard

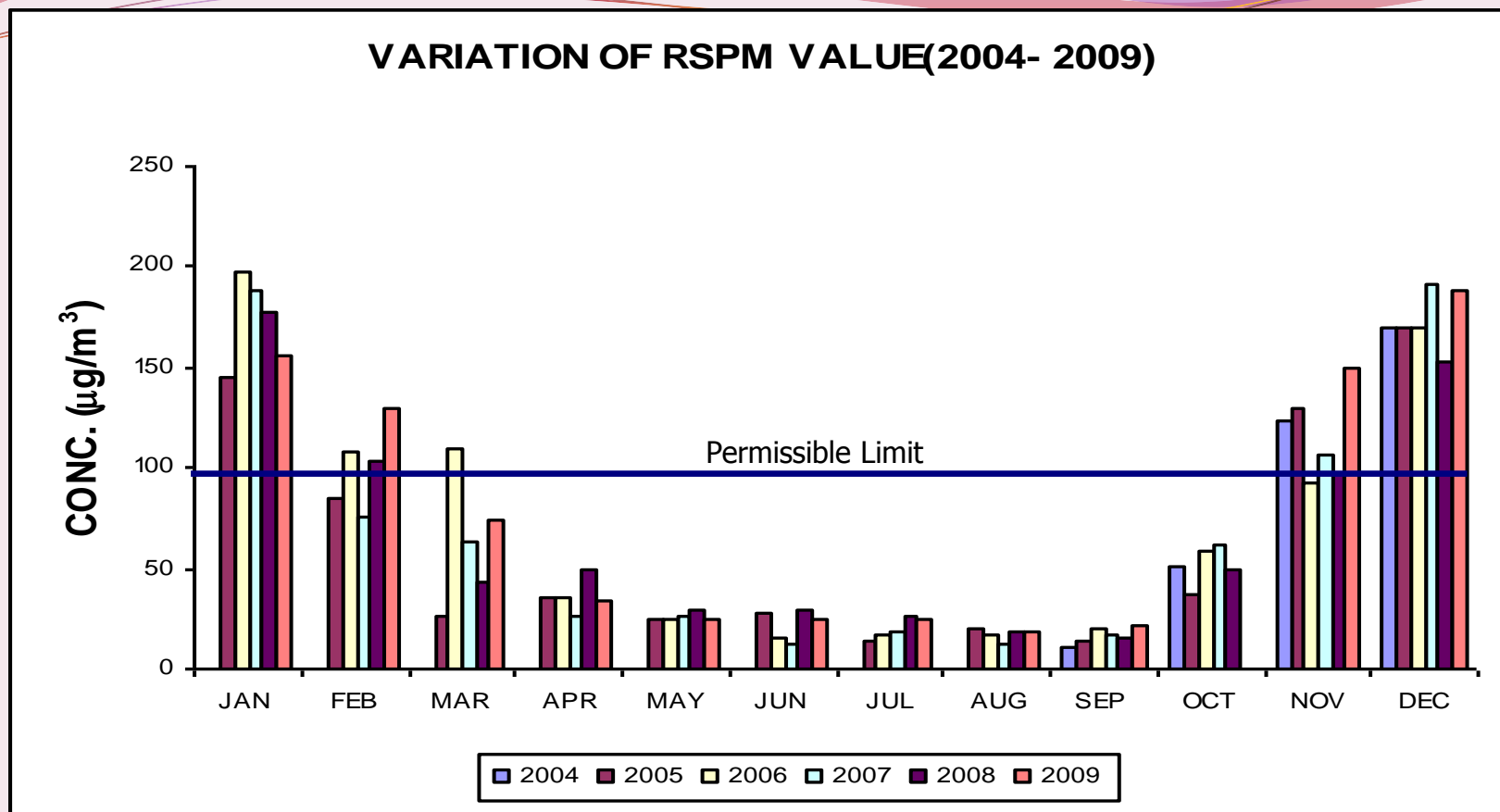
Data Analyses: Water

- ❖ Chloride concentration varies from BDL to 10 mg/l due to proximity to sea
- ❖ SO_4 in the rain water varies from BDL to 15.4 mg/l.
- ❖ The quality of surface run-off and pond water suitable for adequate organisms including fish, except a marginal increase in chloride, sodium and sulphate contents indicating influence of sea water.
- ❖ The river water is saline

Characteristic : Sediment/Soil (2009)

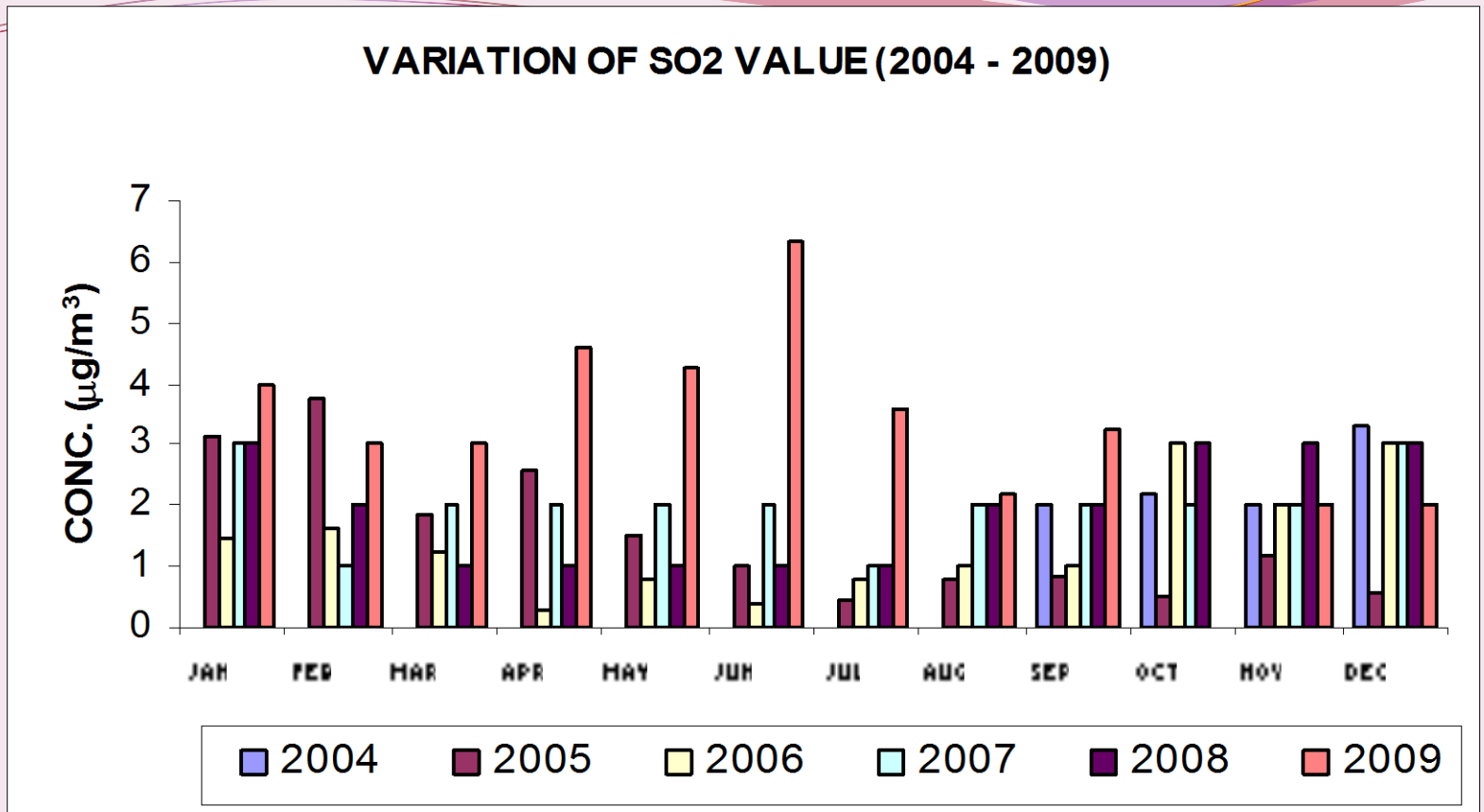
- Chemical characteristics of the sediment/soil indicates fairly fertile with reference to plant nutrients.
- Exchangeable Calcium is found to be dominant 'cation'
- Frequent inundation of land during high tide with saline water ingress of sea water through drain has increased the concentration of total nitrogen
- Exchange capacity of the soil positively correlate with organic carbon.

Figure 1 & Table 1: Variation of RSPM ($\mu\text{g}/\text{m}^3$) Value (2004-2009)



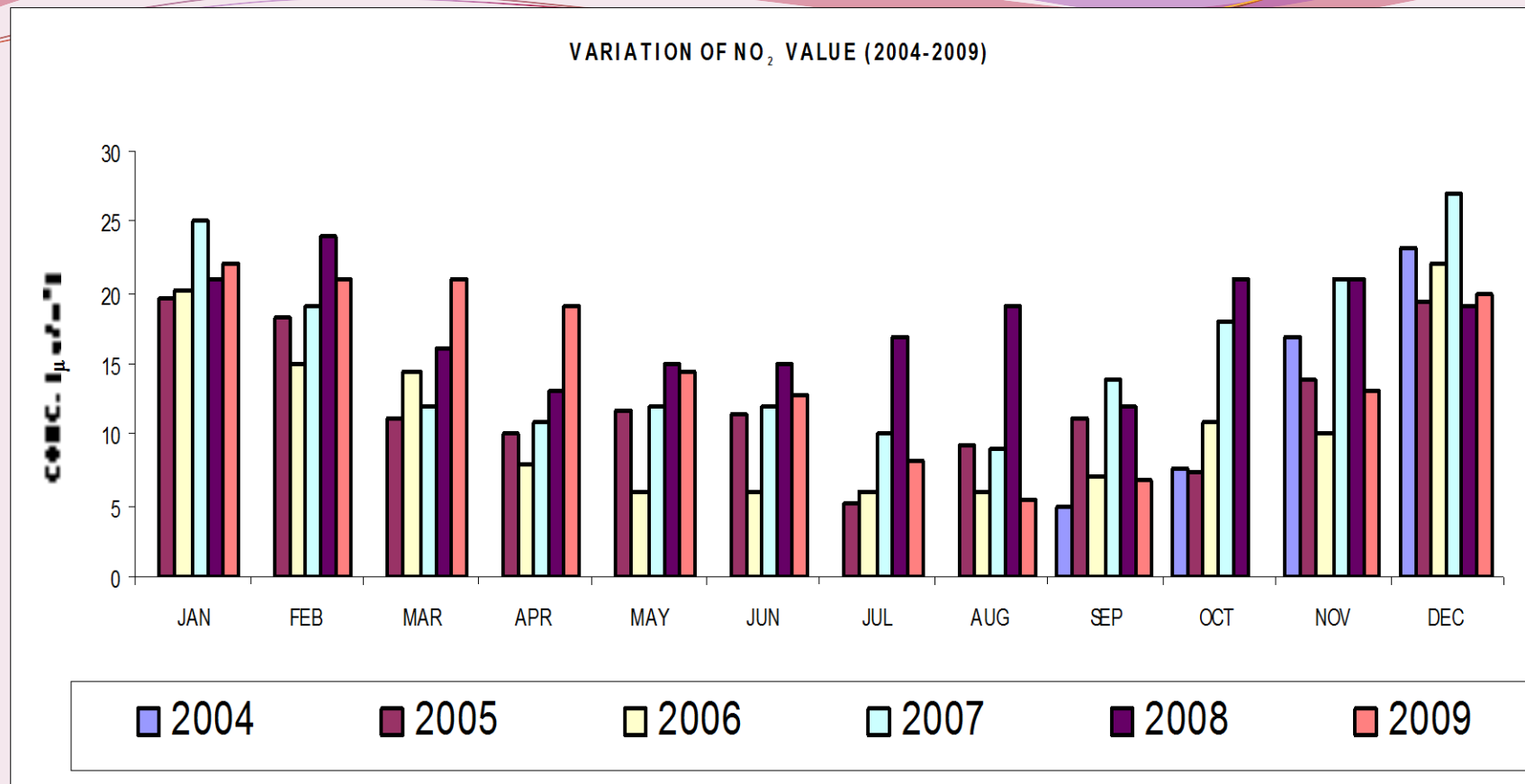
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2004	-	-	-	-	-	-	-	-	11	51	124	170
2005	146	85	26	36	24	27	14	20	14	37	129	170
2006	198	108	109	36	25	16	17	17	20	58	93	170
2007	188	75	64	26	26	12	18	13	17	61	106	191
2008	178	103	43	49	30	29	27	19	16	50	97	153
2009	156	129	74	34	25	25	24	19	22	-	149	189

Figure 3 & Table 2: Variation of SO₂ (µg/m³) 2004-2009



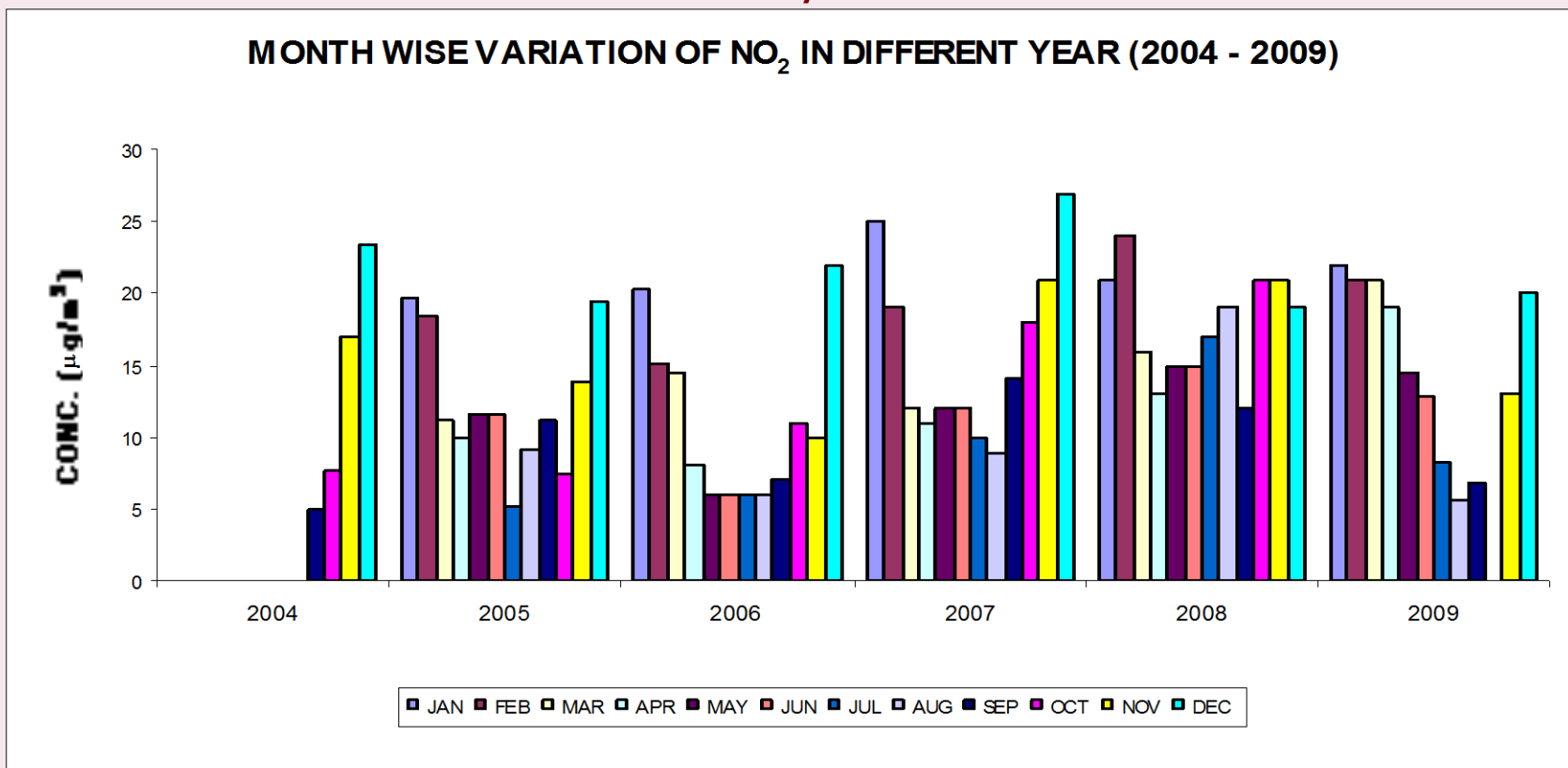
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2004	-	-	-	-	-	-	-	-	2	2	2	3
2005	3	4	2	3	2	1	0	1	1	1	1	1
2006	1	2	1	0.3	0.8	0.4	0.8	1	1	3	2	3
2007	3	1	2	2	2	2	1	2	2	2	2	3
2008	3	2	1	1	1	1	1	2	2	3	3	3
2009	4	3	3	5	4	6	4	2	3	-	2	2

Figure 5 & Table 3 : Variation of NO₂ (µg/m³) 2004-2009



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2004	-	-	-	-	-	-	-	-	5	8	17	23
2005	20	18	11	10	12	12	5	9	11	8	14	19
2006	20	15	14	8	6	6	6	6	7	11	10	22
2007	25	19	12	11	12	12	10	9	14	18	21	27
2008	21	24	16	13	15	15	17	19	12	21	21	19
2009	22	21	21	19	15	13	8	6	7	-	13	20

Figure 6 & Table 3 : Month wise variation of NO₂ ($\mu\text{g}/\text{m}^3$) in different year 2004-2009



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2004	-	-	-	-	-	-	-	-	5	8	17	23
2005	20	18	11	10	12	12	5	9	11	8	14	19
2006	20	15	14	8	6	6	6	6	7	11	10	22
2007	25	19	12	11	12	12	10	9	14	18	21	27
2008	21	24	16	13	15	15	17	19	12	21	21	19
2009	22	21	21	19	15	13	8	6	7	-	13	20

Table 4: Chemical characterization of rain water in Canning (2004-09)

Sampling Date	pH	Cond (ms/cm)	Na+ mg/l	K+ mg/l	TH mg/l	Ca ²⁺ mg/l	Mg ²⁺ mg/l	Cl ⁻ mg/l	NO ₃ -N mg/l	NH ₃ -N mg/l	SO ₄ mg/l
21.10.05	5.8	5	0.27	0.46	-	BDL	BDL	3.00	0.09	BDL	BDL
21.10.05	5.6	4	0.22	BDL	-	BDL	BDL	4.00	0.04	BDL	BDL
13.04.06	5.2	28	0.95	0.30	20	5.00	2.00	9.00	0.54	1.5	13.4
13.04.06	5.9	61	2.06	0.94	44	9.00	5.00	19.00	1.16	2.6	15.4
03.07.06	6.2	63	7.98	0.26	-	1.87	1.03	11.4	1.22	0.71	2.37
10.07.06	5.9	22	2.72	4.11	-	1.06	BDL	6.50	1.11	0.43	1.44
10.07.06	5.7	20	2.25	1.03	-	1.94	0.36	1.51	0.66	0.42	1.1
27.07.06	5.6	4	BDL	0.48	-	0.34	BDL	2.65	0.37	BDL	0.1
21.08.06	5.8	5	0.76	0.55	-	4.78	1.02	2.13	0.36	0.23	0.34
07.05.07	5.0	11	0.58	BDL	BDL	0.75	0.22	0.95	0.94	0.6	0.75
07.05.07	4.7	11	0.56	BDL	BDL	0.64	0.29	0.69	0.93	0.69	0.82
13.06.07	6.1	42	1.60	BDL	10	3.80	0.37	2.00	5.20	1.3	2.96
03.07.07	5.3	5	0.68	5.60	BDL	0.22	-	1.60	0.64	0.05	0.56
03.07.07	5.1	7	3.42	0.71	BDL	0.98	-	6.34	0.30	0.17	BDL
23.07.07	5.9	14	1.88	1.78	-	3.87	1.06	2.30	1.91	1.05	1.17
24.09.07	6.1	11	2.67	1.34	-	2.16	0.54	2.93	0.98	0.17	1.11
17.06.08	5.5	5	BDL	BDL	BDL	2.00	BDL	3.00	0.14	BDL	BDL
18.07.08	6.5	10	BDL	BDL	BDL	BDL	BDL	3.37	0.67	BDL	6.0
29.07.08	6.0	14	1.60	0.5	BDL	BDL	BDL	7.71	0.24	BDL	2.5
12.08.08	5.8	14	1.30	BDL	BDL	BDL	BDL	7.70	0.90	BDL	4.4
19.08.08	5.6	9	BDL	BDL	BDL	BDL	BDL	5.00	0.72	BDL	6.7
11.05.09	6.15	41	-	-	10	2.8	BDL	5.42	-	BDL	-
07.07.09	5.95	14	0.9	BDL	2	BDL	BDL	1.4	0.05	BDL	2.8
06.08.09	6.29	22.1	2.62	BDL	6	2	BDL	3	0.32	-	3.43

data in green colour shows minimum value and in red colour shows maximum value

Table 5: Characteristics of the sediment/soil from the vicinity of the monitoring station collected in 2009

Sl. No.	Sample Code	pH	Ex-Ca (me/100g)	Ex-Mg (me/100g)	Ex-Na (me/100g)	Ex-K (me/100g)	O.C. %	T.Nitrogen (mg/kg)	Available Phosphorus
1	Pond	5.60	144.00	58.00	25.00	13.00	3.38	1753.00	14.20
2	Agriculture Field	5.40	72.00	62.00	30.00	17.00	1.99	2525.00	9.40
3	Drain	4.90	115.00	137.00	66.00	37.00	2.29	4032.00	59.30
4	Pond	7.50	130.00	86.00	90.00	51.00	0.86	1200.00	136.00
5	Canning River	7.80	266.00	126.00	58.00	33.00	0.68	523.00	42.00

Proposal of Future Monitoring Plan

- Monitoring of New Parameters
- Characterization of particulate matter and its necessary impact on agriculture.
- Better instrumentation for monitoring of PM₁₀

Monitoring at Other Locations- Phase-III

Stations	State	Borderin g	Operating since	Latitude	Longitude
Dawki Terrace building, Dawki, Jantia Hills District	Meghalaya	Banglade sh	August 2009	26 ⁰ 47'06" N	91 ⁰ 30'52" E
Dera Baba Nanak	Punjab	Pakistan	August 2009	32° 1' 60 N	75° 1' 0 E
Lakshadwe ep	Lakshadweep	Maldives	Station is under commissioning	10° 00' N	73° 00' E
Daranga, Baska District	Assam	Bhutan	March 2009	26° 48' 0N	91° 31' 0E

CORROSION RACK UNDER THE BACKDROP OF TAJMAHAL, INDIA

Date of Installation: 2006-11-25
Geographic Location : N 27° 10' 18.12"; E78° 02' 26.52"
Regional Air Pollution in Developing Countries (RAPIDC) Station No. 21

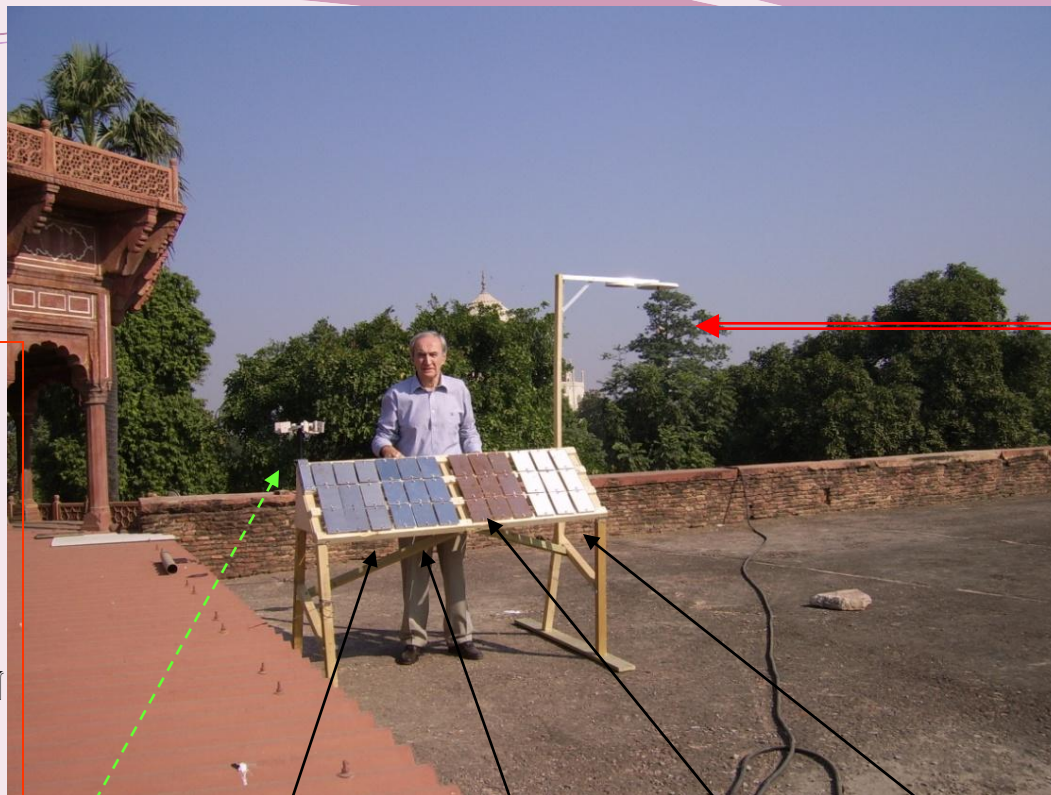


1/20/2011

STANDARD STUDY MATERIALS USED AT TAJMAHAL

- Under this activity Copper, Zinc, Painted Steel, Carbon Steel and Stone samples (three sets of three each i.e. total nine samples) are being exposed
- Exposure for the 'one year' and two years completed in November 2007 and November 2007 and one set of each material (03 samples each) have been submitted for analyses, while four year study shall be completed on November 25, 2010.
- Report on the investigation and one international paper have been prepared.

AIR QUALITY MONITORING STATION AT TAJMAHAL



PARAMETERS:

PM₁₀₀, PM₁₀,
& PM_{2.5};

SO₂ & NO₂

METEOROLOGICAL;

CHEMICAL

CHARACTERIZATION
OF PARTICULATES

Diffuser samples are also exposed regularly during Nov 2006 to December 2007 for monitoring of ambient HNO₃, SO₂, NO₂, O₃ and particulate deposition

Stone samples, Carbon Steel, Painted Steel, Copper and Zinc

Standard Material Exposure at Tajmahal

PASSIVE SAMPLES USED AT THE SITE

- The passive diffuser samples were exposed regularly during Nov 2006 to December 2007 for monitoring of ambient HNO_3 , SO_2 , NO_2 , O_3 and particulate deposition at the site
- All exposed samples (total six sets) were forwarded on regular intervals (every two months with temperature & Humidity data) to Corrosion & Metal Research Institute, Sweden for analyses
- Data analyzed and report prepared by Male' Secretariat
- Study discontinued

Crop Impact Assessment

- UNEP is directly coordination the activity and no role has been specified for NFP and NIA, India
 - Activity has been entrusted to Indian Agricultural Research Institute, New Delhi and Banaras Hindu University, Varanasi, India
 - Report has been compiled by respective institute and comments are being compiled at UNEP

National Advisory Committee: Recommendations

- Advisory Committee will review the data before it is forwarded to the Male` Secretariat.
- Possibility of increasing the number of monitoring stations will be examined along with feasibility to outsource the monitoring to academic institutions, which would not only enhance the participation of local stakeholders but also improve the quality of data.
- Monitoring of PM_{2.5} may be initiated at all the stations covered under Male Declaration, as PM_{2.5} is a better indicator of large range transportation than PM₁₀ or TSP.
- Possibilities of adding new relevant site specific parameters
- Possibility of collaboration with Indian Meteorological Department (IMD) for generating meteorological data at ambient air quality monitoring sites will be explored. This would facilitate better interpretation of the data and understanding of the sources. Further, satellite modes of measurement should also be considered involving agencies like ISRO, Ahmedabad.
- Corrosion studies may be initiated at few more locations including one location in Central India.

Presentation-Agenda

- Plan for Phase IV (next 3 years:2010-2012)
 - Details of National Implementing Agency and Institutional Arrangement
 - Monitoring Plan
 - Existing Station (including new parameters to be included)
 - New Station
 - Plan for emission inventory and modeling
 - Plan for impact assessment including capacity of the expert institutions
 - Health Impact
 - Crops Impacts
 - Material Impacts

Institutional Arrangements Phase-IV

- No changes in the Institutional Arrangement for implementation of Activities under Male' Declaration Program (at the national level)
- Identification of National Institutes for Impact Assessment Studies (Crops, Human Health and Materials)
- Development of Expertise for Trajectory analyses /mechanism of trans-boundary movement of pollutants / modeling for Trans-boundary movement of pollutants

Monitoring Plans

- Continue monitoring activity and data scrutiny
- QA/QC Check for all 4 new stations including audit
- Development of Infra-structure according to new parameters (new AAQS) at all monitoring locations
- Monitoring of new parameters (new AAQS) at all monitoring locations
- Data Submission

(No new stations are proposed during Phase-IV)

Investigations

Impact Assessment : Materials

- Study titled, "Impact of Air Pollution on corrosion of metallic and non-metallic materials " awarded to National Metallurgical Laboratory, Jamshedpur
- Need: Establishment of methodology & Networking

Impact Assessment Health and Crops

- Identification of Institutes
- Evaluation by the Advisory Committee
- Development of Protocols
- Award of Activities
- Regular Assessments

Other Activities

1. Participation in the IG11 at Dhaka
2. Participation in Task Force Meeting for Future Development at Bangkok
3. Organization of Hands on Training Programs for NEC-Officials
4. Development of Monitoring Protocol for Indoor Air Quality in association with IIT-D
5. Regular interaction with Male' Secretariat and organization various programs including capacity building (including the recently completed)
6. Organization '4th refresher course' (November 18-19, 2010)



Thank you all