Malé Declaration on Control and Prevention of Air Pollution and its Likely Trans-boundary Effects for South Asia

Report of the Seventh Regional Training Programme and Refresher Course

Central Pollution Control Board
New Delhi, India

March 2009

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Background

The Centralized training programme on monitoring transboundary air pollution under Malé Declaration is being held almost every year since 2002. The objectives of the training program are to strengthen the monitoring network based on the common methodologies and standards at the national level and to share experiences on developing national monitoring stations and monitoring data analysis. The training programs are attended by laboratory technicians and project managers who are in charge of Monitoring Station and monitoring activities in Malé participating countries as well as the members of Monitoring Committee (MoC), Swedish Environmental Research Institute (IVL), Stockholm Energy Institute (SEI), United Nations Environment Programme (UNEP), Regional Resource Centre for Asia and the Pacific (RRC.AP) and Asian Institute of Technology (AIT). Details on all the trainings conducted are available in the website, in http://www.rrcap.unep.org/male/.

REPORT OF THE TRAINING PROGRAMME

Introduction

1. The Seventh Regional Training Programme and Refresher Course was held in New Delhi, India on 16-19 March 2009. The main objectives of the training are: 1) to strengthen the monitoring capacity; 2) to share and discuss the issues encountered in operating the monitoring station in each county; 3) to update the implementation activities under Malé Declaration in each country and 4) to discuss on prioritization of the Phase IV implementation of Malé Declaration activities. The training was organized by Central Pollution Control Board (CPCB), New Delhi together with UNEP RRC.AP. The agenda is enclosed as Attachment 1.

2. Thirty two participants from member countries who were drawn from the national implementation agencies and national focal points supporting the monitoring programme under the Malé Declaration participated in the training. Resource persons from SEI, IVL, MoC, CPCB, UNEP RRC.AP, and AIT also attended the training programme. The list of participants is given as Attachment 2.

Opening Session

3. The session started with remarks from Dr. S. D. Makhijani, CPCB. He emphasized the importance of quality assurance on the monitoring data which is strongly needed for policy making.

4. Mr. Mylvakanam Iyngararasan, UNEP RRC.AP gave a brief remarks on the regional level activities related to air pollution networks, convention in Asia and Pacific in general. He specifically mentioned the EANET activities; ASEAN (10 countries) on transboundary Haze issue; Central Asian Framework Convention on Environmental Protection for Sustainable Development where Uzbekistan is responsible on air pollution activities. He also referred to the decisions at the 25th Session of the UNEP Governing Council/Global Ministerial Environment Forum, the high-level environment policy forum of the United Nations (UN). He highlighted the decision on legal binding agreement for Mercury (Hg). He also mentioned that this training in its way forward will focus more on data quality and that the quality cannot be checked unless the data is being used. He ended his opening address giving thanks to Ministry of Environment and Forests (MoEF) and CPCB, India for organizing the training programme.

5. Dr. Rashid Hasan, MoEF who is in charge of CPCB activities gave his remarks. He mentioned that air pollution does not have boundary and stay for four to five days in the atmosphere. He highlighted sharing of good practices, experiences, technical and

other support to neighboring countries, a good chance for India to help in building the capacity of others.

6. Mr. J. S. Kamyotra, CPCB gave his key note speech. He mentioned his experiences in working with neighboring countries through Malé activities and the importance of closely working with each other. For better understanding and interaction among the countries, he pointed out the importance of continuity of the activities. Through this continuity he believes it will bring harmony and the possibility of having uniform standard among the countries. He ended his talk with a suggestion to think of more activities that will benefit the region which will be included in the Phase IV implementation of Malé Declaration (MD). He also pointed out the need for the air quality monitoring and the importance of atmospheric issues which affect the climate to be included in Phase IV implementation. He also stressed the importance of ownership in all the activities.

7. Dr. Kevin Hicks, SEI, gave thanks to CPCB and SEI for the technical support to MD. He mentioned that SEI is committed to devote the support to MD in all technical areas needed. He also mentioned that Sida is considering providing financial support for the Phase IV implementation. He stressed the importance of producing quality data for policy making.

8. Mr. R. N. Jindal, MoEF gave his remarks where he emphasized the need to focus on capacity building in the regional and national level.

9. After all the opening remarks, a brief presentation on the progress of MD Phase III Implementation was done by UNEP RRC.AP. Highlights of the presentation include:

    - During 2007/2008 period, the tenth session of the intergovernmental meeting, fifth regional stakeholders meeting and two national stakeholders meetings were held to strengthen the regional cooperation on transboundary air pollution issues. Three new monitoring stations have been established and five more stations are being establishing. Most of the NIAs have started monitoring ozone (O3) and rainwater chemistry. A data analysis report, compiling the data from the last 5 years of monitoring, has been composed and has been discussed during the IG10 meeting.
    - Three publications: 1) "Past, Present and Future of Malé Declaration 2) Good Practices on Prevention and Control of Air Pollution: A Compendium and 3) Youth for Clean Air were lounged during the opening of the IG10 and RSC5 meeting.
    - Manual on emission inventory has been completed and three countries have finished compiling their national emission inventories while the compilation of inventories are ongoing in the other countries;
    - Impact Assessment Studies on Health, Crop and Materials, Rapid Urban Assessment and the corresponding capacity building activities have been carried out.

- Newsletters and country brochures have been composed. The newsletter has largely been reported the network's activities. Countries are therefore encouraged to provide inputs on national activities. Besides, a Youth for Clean Air publication and an e-learning CD has been produced by the South Asia Youth Environment Network (SAYEN).

Report on the progress on country monitoring programme

10. Representative from Bangladesh, India, Iran, Nepal, Maldives and Sri Lanka presented the status of implementation of MD in their respective country. All countries presented their data report, monitoring site and activities during Phase III. It was mentioned by almost all countries that wet only collector is not working properly due to the tropical condition. The following are some of the points highlighted during the presentations.

11. **Bangladesh:** Mr. Hashmi and Mr. Syed Ahmmad Kabir, Department of Environment, Bangladesh presented the status of the monitoring site and the data analysis report. It was mentioned that the concentration analysis of air pollutants by high volume samplers and diffusive samplers and the analysis of rain water have been carried out. Also, metrological parameters have been collected. The data obtained through the activities was interpreted and presented. Challenges encountered includes difficulty to retain trained technicians, irregularity of electricity supply, difficulty in replacing funnels and other accessories, difficulty in the maintenance of equipments, insufficiency of triple distilled water which makes the problem with ammonium analysis as blanks turn blue with indophenols method, and difficulty in identifying the end point of argentrometric method for chloride during low concentration. To address the problem on the insufficiency of distilled water, it was suggested that deionized water should be used. It was recommended to use an ion exchanger instead (with distillation NHx to appear when the distillate is cooling). It was mentioned that in Phase IV activities, $PM_{2.5}$ will be measured if equipment will be made available.

12. **India:** Dr. S. D Makhijani, CPCB, India presented the status of monitoring sites and data from Port Canning, Sunderbans, and four new monitoring sites sanctioned for MD monitoring network. The process of the establishment of new monitoring stations at Dawki, Meghalaya bordering Bangladesh on Eastern side; Pathankot, Punjab bordering Pakistan; Lakshadweep islands bordering Maldives; Daranga, Baska District near Bhutan Border were presented. Monitoring activities on SO_2, NO_2, RSPM and rainwater chemistry are being carried out at Port Canning station. Data being collected were interpreted and presented. It was found out that the 24-hourly average concentrations of SO_2 and NO_2 are much lower than ambient air quality standards; RSPM concentrations exceed the prescribed standards, particularly during

winter season. Also, he said that the crop and health study that has been conducted in the country will be shared to the Malé website.

13. **Iran:** Mr. Maziar Soleimannejad, Iran presented the report on Ilam station with the data analysis report. He mentioned the problems they encounter at the monitoring station. Due to high temperature, sunlight and strong winds, the equipment at the site were damaged. He also mentioned that Dehloran has low precipitation in a year and a specialist for measuring NH_4 and NO_2 in the field is needed. He said that the maintenance of air pump, electricity power, and guardianship, and others are expensive. He also presented several programs for air quality control in Iran. Mr. Reza Mirshekar, in-charge of second monitoring site at Zahedan presented the selection of the site, their needs and the progress on establishment of the station. He said that the electricity problem at the site was solved.

14. **Maldives:** Mr. Ahmed Muslim, Maldives presented the progress of monitoring activities under MD. He mentioned that during the northeast monsoon period, the air pollution increased and the pH level decreased. He also said that they could measure pH and EC only and trace gases monitoring was not conducted due to lack of financial support from the government. The MD monitoring site is also the ABC monitoring site and the data collected for both issues were presented. Future plan of activities include monitoring PM concentration in the capital city, rain water analysis as well as pH, EC and trace gases monitoring in the central and southern part of the country.

15. **Nepal:** Ms. Bidya Banmali Pradhan, Nepal presented the monitoring activities, emission inventories, rapid urban assessment and the data report from the monitoring site. She mentioned that sulphur data is high near the International Centre for Integrated Mountain Development (ICIMOD) site due to the Blinkling industries near the monitoring site. She also mentioned that the results of the crop impact assessment experiment on EDU and non EDU is almost the same. She said that the reason for stopping the HVS monitoring is due to power sharing (load sharing) which is not sufficient to run HVS as required. With this, it was suggested to use battery or solar power operated equipment for monitoring. She also mentioned that shortage of deionized water is one of the difficulties faced. She requested that additional station representing mid hills should be made and that public awareness campaigns should be focused during Phase IV MD implementation.

16. **Sri Lanka:** Mr. R.N.R. Jayaratne, Central Environmental Authority, Sri Lanka presented the details of the monitoring activities, data completeness, the challenges and difficulties faced as well as the plan for monitoring activities in the next 3 years under MD Phase IV. He mentioned that the installation of the new monitoring station is on-going and will be finished soon. He mentioned that the second station will be at Hortan plains. Challenges and difficulties include high temperature, bird drop, insufficient chemical, and the spare parts need for wet only collector. Future plans include shifting Dutuwewa monitoring site to Doramadalawa, starting the dry

deposition monitoring of PM_{10} in parallel to wet deposition monitoring, passive sampling at the selected second site (Horton plains) with PM_{10} wet deposition and dry deposition monitoring, as well as expanding corrosion studies to several locations to represent a country average (at least Kandy, Doramadalawa and Hortan Plane).

Site Audit

17. Mr. Sagar Daha presented the site audit report on all the monitoring sites. Three persons including Martin, Dr. Siddiqi and himself were involved in this activity. He mentioned that for good data, good human resources development is needed. Monitoring protocol is not well understood in most of the sites, hence in-country training is still needed. Problems related to the instruments including no proper instruction given on how to operate the instruments, no available manual in the site, lack of skills on how to do the calibration, shortage of spare parts, power problem due to the high power requirement of the equipment are very common to all the countries. He also mentioned that proper support from policy makers is not given in most of the sites. He also said that documentation, communications, the location of the laboratory for data transfer and the need to do annual site audit is essential for data quality purpose. It was suggested that the definition of monitoring site provided in Malé manual should be changed due to the fact that in most of the sites, proper operating is not accomplished. All site auditors suggested that the manual need to be available at the site in both English and local language.

Summary of site audit report in Iran, Maldives, Nepal and Sri Lanka are as follows:

- The station in Iran is the hottest in the region. Three other areas potential for monitoring sites were suggested. It was mentioned that one site on the eastern border meets the criteria for remote site, and other candidate sites are located at Ghaleroom on the Afghanistan border and Ghargarook on the Pakistan border. It was also mentioned that instruction manual was translated into Faci. Challenges include insufficient manpower to do data collection and data analysis. The need for more interaction with neighboring countries on QA/QC was strongly expressed.

- For Maldives site, the interference of the sea and airport was mentioned. It was suggested to move the monitoring site closer to Malé if the ABC project on Hanimadhoo is willing to share data. Challenges faced include the lack of manual at the site, and the transfer of knowledge not done effectively.

- In Nepal, only one bulk collector is installed and manual is not available at the site. Also, the monitoring protocol is not well understood.

- In Sri Lanka, as there is no power at Dutuwewa, CEA has suggested a new site in the Mihintale forest area (8^o 24' 30" N, 80^o 29' 00" E), 40 km SSW of Dutuwewa, which was inspected and was found suitable as a remote site, provided the small population living in a 5 km radius around the proposed site switch from firewood to LPG for cooking energy. It was suggested that before transferring the monitoring station to the new suggested site, monitoring should be conducted in both sites to compare the effectivity of monitoring, then will be finally decided which location is better. At present, NIA is monitoring on both sites.

Second attempt on Inter-laboratory comparison

18. Dr. Kim, AIT, Thailand presented the inter-laboratory report. She mentioned that the main objective of the activities is on QA/QC. She mentioned the procedure of the analysis, as well as the results from reports of all the NIA. She presented the second attempt of the report in comparison to the first attempt. She mentioned that the best parameter is Na+. There is a big improvement between 1st attempt and second attempt. Recommendations made for improvement of data quality include strict correspondence to the MD QA/QC monitoring protocol, use of methods requiring less sample treatment, as well as repeating analyses for precision estimate. Recommendations specifically for sample analysis include standard reference materials (SRM) to be provided to NIAs to evaluate the measurement methods, NIAs to check and make sure that deionized water used has the conductivity <0.15mS/m (for dilution of samples and cleaning glassware).

Phase IV activities

19. Mr. Iyngararasan, presented the summary of Phase IV activities to be prioritized due to Sida support constraint. He expressed UNEP's plan for finding other donors to support Malé activities. The prioritized activities were discussed one by one with input from participants. The meeting agreed that the Secretariat will send this summary table to the countries (NFPs and NIAs) for their comments within two weeks time after the training workshop.

Data Analysis Report

20. Dr. Pawana presented the data analysis report prepared and agreed during IG10 in Sri Lanka with corrections points on data for each country. Suggestion on the data analysis report are as follows:

    - To include Glossary/Abbreviation in the report. Suggested not to include NRSPM. It was also agreed to leave it blank if data are not correct. The data are suggested to analysis in wet season, dry season and annual report and to include deviation of the data in the report. It was also suggested to mentioned detection limit and agreed that whatever is not appropriate need to take out.

    All the countries agreed to provide correction on their own data

21. Dr. Martin Ferm presented the passive sampler data which were analyzed in IVL laboratory and gave his comments as below:

    - Some passive samplers were missing and the important of missing data were explained. He also mentioned that there is no back up system in MD network.
    - According to passive sampler data analysis report, Nepal has very good data due to their consistency in following the sampling and sending the data to IVL according to protocol. Iran may have post office problem.
    - There was discussion on blank samplers and IVL agreed to write new instruction clearly on how to expose the samples on the envelope. Monthly exposure of passive samplers was reminded.
    - The participants confirmed the receipt of new bulk sampler sent by IVL.

22. Dr. K. Hicks presented the analysis on the results of Malé Declaration monitoring data, air pollution impacts assessment on Crop, Health, soil acidification and Corrosion studies under Phase III implementation. He explained his finding using the modeling and following are some of highlights from his presentation.

    - Crop: EDU data have demonstrated that significant yield losses are occurring to important local crop varieties across the South Asian region. Continued investigations are needed to try to better understand the role that the interactions between O_3, climate, and crop cultivar have on O_3 sensitivity. He also mentioned the other factors that need consideration in relation to the results.
    - Soil Acidification: Assessment on soil acidification was presented using maps. These maps need to be compared with data from Malé Declaration monitoring sites. Estimates need to be made of nitrogen and sulphur wet plus dry deposition in units that can be compared to critical loads.
    - Corrosion: Attempts to predict corrosion values in Asia/Africa using dose-response functions developed in Europe have failed, especially for limestone where the corrosion is much higher than expected. Therefore, new dose-response functions have been developed for carbon steel, zinc, copper and limestone.

23. Mr. A. Pathak, CPCB presented the wet deposition monitoring protocol and station sitting guidelines under Malé Declaration. He mentioned the procedure on the ions analysis for the participant to analyse in the CPCB laboratory. After his presentation the participant were divided into two group for practical session.

Laboratory Session

24. The laboratory practice sessions on Ironic balance analysis were initiated and the practice was done at the CPCB air laboratory. A brief explanation of the steps to be followed was explained before the practice and the participants were divided into two groups. The participants were guided, supervised and helped by the laboratory

personnel led by Dr. R. C. Srivastava & Mr. M. Satheesh of CPCB. Calculation of R1 and R2 were explained and the participants followed the instruction and worked in a group using data from their analysis result. Each group shared their data analysis procedure and explained the procedure on how they did their experiment at the end of the session. The results of the group work were presented with reference sample as mentioned in Attachment 3.

Overview of CPCB role in India

25. Dr. S.D. Makhijani, CPCB presented the overview of the CPCB role in India and their experience during the last 7-8 years. He mentioned that CPCB is a technical arm for MoE. All standard and policies for environmental related issues is under the care of CPCB. CPCB is coordinating with all the state pollution control board. He also said that an action plan to address the major air pollution problem in the cities will be developed. Industries are the main polluters and this will be addressed in the action plan. Also, poor vehicular technology which contributes to the issue of air pollution will be addressed.

QA/QC and Standard Operating Procedure

26. Mr. A. Monoharan, CPCB, presented the QA/QC on water analysis with CPCB experience. His presentation was followed by the presentation on the importance of Standard Operating Procedures (SOP) based on CPCB experience. He presented the procedure used in CPCB laboratory on SOP and compared it with draft MD guideline.

27. Mr. Sagar Dhara presented the draft SOP guideline developed for MD. It was agreed that this SOP will be finalized with inputs from all resource persons of the training programme within a month and will be sent out to all the NIAs for their final comments. The countries including Bangladesh, India, Iran and Sri Lanka agreed to develop their country specific SOP manuals based on the MD SOP within three months time. Moreover, Bangladesh and Iran agreed to translate SOP manual into their local language.

Closing Session

28. Dr. Dipankar Saha, CPCB gave summary remarks on the programme and chaired the closing session.

29. Dr. K. Hicks presented the summary and conclusions of the training programme. He mentioned key objectives of the training programme which includes aassessing of the status of Malé monitoring sites, reporting on inter-laboratory comparison of rain water analysis, data quality and analysis, conducting the training in monitoring and

analytical procedures, and developing SOP manuals. He also mentioned the information sharing, information on CPCB activities and facilities as well as the prioritization of MD Phase IV implementation activities. Details of his presentation on summary and conclusions of training programme is enclosed as Attachment 4.

30. Mr. J. S. Kamyotra delivered the closing remarks. He emphasized the importance of data analysis, result and QA/QC of the programme. He also mentioned the importance of interaction among the NIA from participating countries through email, or phone which he believed will develop the same spirit to continue for the success of the implementation of the programme. He thanked all the participants and his CPCB team for making the training programme a success.

31. On behalf of all the participants, Mr. Ahmed Muslim, expressed that the training workshop was fruitful. One of the important things he learned form this training is how to analyze the data taken from the monitoring activities and also on operation of HVS.

32. Prof. S. P. Gautam, Chairman of CPCB, presented certificate to participants and gave his closing remarks. He pointed out the importance of the impact on air pollution on human health. Balance is important in addressing the air pollution issue. Distinction between synchronization is needed in addressing all the issues. He also mentioned the need to continue the training on transboundary air pollution. He said that CPCB could possibly help not only on scientific issue but also on programme management. He ended by thanking all participants.

33. On behalf of Malé Secretariat, Ms. Wah Wah Htoo expressed her gratefulness to all the participants and to CPCB for their efforts in arranging the training workshop even within a short period of time. She further congratulated CPCB for their well organized arrangements.

Field Trip

During the last days of the training programme, all the participants visited Parivesh Bhawan and ITO monitoring stations in Delhi. These air pollution monitoring stations are combined with a small laboratory and are operating 24 hrs a day, 7 days a week for the whole year round. Both manual and automatic analysis is done in this station and the data were reported daily to the newspaper press office. The data from all the monitoring stations are available on the CPCB's website on a daily basis.

Training Workshop Experience and Evaluation

The participants were actively involved in the workshop. Emphasis were given to data analysis report, quality assurance of the data, development of standard operating

procedure, prioritization of Phase IV plan and future development of monitoring activities. After the closing session, an evaluation form was filled in by the participants. The summary of the responses is given in Attachment 5. Suggestions made are given as follows:

- Longer time should be allocated for the laboratory sessions (measurement, calculations and calibration). During laboratory exercises, each group should be headed by a participant who works in laboratory to ensure proper learning and quality of work.
- Training workshop should not be mixed with other matters (e.g. discussion on Phase 4, data & reporting).
- A separate training for technicians on how to maintain and calibrate each equipment should be done.
- More elaborative descriptions should be included in the training materials. CDs containing the workshop training materials and videos/illustrations for laboratory work should be distributed to the participants to guide them even after the training.
- A person among Malé countries, who can give technical assistance to those who may need should be identified. This person may assist through sending emails to those in need. It is also better if he can go (provided with financial support from UNEP) to the country where there is a need.

Attachment 1

Agenda

Day 1: March 16, 2009

Venue: Hotel Lemon Tree, East Delhi Mall, Kaushambi, Ghaziabad

08:30-09:30	Registration
09:30 – 10:30	Opening session
10.30 – 10: 45	Progress of Implementation of Malé Declaration: UNEP
10:45 – 11:15	***Tea/Coffee Break***
11:15 – 13:00	Country reports: Monitoring status and needs ***(Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan, Sri Lanka)***
13:00 – 14:00	**Lunch Break**
14:00 – 14:45	Monitoring Station and Site Audit report**:** Dr. Martin Ferm and Mr. Sagar Dhara
14: 45-15:30	Presentation and facilitated discussion on rain water result analysis on inter laboratory comparison: Dr. Nguyen Thi Kim Oanh
15:30 – 15:45	***Tea/Coffee Break***
15:45 – 17:30	Prioritization of the Phase IV implementation activates: UNEP
19:00 - 22:00	**Reception Dinner**

Day 2: March 17, 2009

Venue: CPCB Training Hall

09:00 – 9:30	Data analysis report 2007/2008 and Quality of Data – Dr. H.K. Parwana
09:30 – 9:45	Data analysis report from passive sampler –Dr. Martin Ferm

9:45- 10:00	Rain water sampling protocol and analytical technique Air Lab Scientist (CPCB) practical (pH, EC, etc.), (Mr. A. Pathak / Mr. Lokesh Kumar/ Mr. J. K. Bhatia, CPCB)
10:00- 10:30	Presentation on interpretation of Laboratory analysis /Monitoring result –Dr. Kevin H
10:30 – 10:45	***Tea/Coffee Break***
10:45 – 13:00	Laboratory analysis (practical session on Particulates- CPCB lab) (Dr. R. C. Srivastava & Mr. M. Satheesh: CPCB)
13:00 – 14:00	**Lunch Break**
14:00 – 14:20	Demonstration on high volume samplers for PM measurement (Dr. R. C. Srivastava & Mr. M. Satheesh: CPCB)
14:20 – 16:30	Laboratory analysis ***Rain water analysis (pH, EC, etc.), Sulphate, Nitrate etc. analysis continue*** (Mr. A. Pathak / Mr. Lokesh Kumar/ Mr. J. K. Bhatia CPCB)
16:00 – 16:20	***Tea/Coffee Break***
16:30 – 17:30	Laboratory analysis (practical section at CPCB lab) continues… ***Rain water analysis (pH, EC, etc.), Sulphate, Nitrate etc. analysis continue*** (Mr. A. Pathak / Mr. Lokesh Kumar / Mr. J. K. Bhatia, CPCB)

Day 3: March 18, 2009

Venue: CPCB Training Hall

9:00 – 9:20	India's National Laboratory: CPCB and its Infrastructure & Air Quality and Management of Air Quality of Delhi –Dr. S. D. Makhijani, Director-CPCB
9:20 – 9:45	QA/QC –Basic Issues for Quality Monitoring: Dr. D. Saha, Senior Scientist
9:45 – 10:30	System Management at Air Pollution Monitoring Laboratory at Agra: Dr. D. Saha
10:30 – 10:50	***Tea/Coffee Break***
10:50 – 13:00	Rain water parameters and computation of R1 and R2 Mr. Sagar Dhara

13:00 – 14:00 Hrs	**Lunch Break**
14.00 – 15.30	Presentation and discussion on data analysis result with R1 and R2 calculation by each group: Mr. Sagar Dhara
15:30 – 15:45	***Tea/Coffee Break***
15:45 -16:30	Presentation and Discussion on guidelines for Standard Operating Procedure (SOP): Mr. A. Monoharan, Senior Scientist Presentation and Discussion on guidelines for Standard Operating Procedure for Male Declaration: Mr. Sagar Dhara
16:30 – 17:30	Panel Discussion and Priority Determination / other issue to discuss and closing session Panel: UNEP RRC.AP, CPCB, MoEF, SEI, IVL

Day 4: March 19, 2009

Field trip	Visit to CPCB laboratory at Parivesh Bhawan and ITO monitoring station
	Water Lab: Mr. A. Monoharan, SS / Mr. J. K. Bhatia
	Air Laboratory: Dr. Dr. R. C. Srivastava, Mr. A. Pathak & Mr. S. K. Sharma;
	Instrumentation & Trace Organic Laboratory: Dr. C. S. Sharma &
	ITO monitoring station: Mr. S. K. Sharma, Mr. M. Satheesh & Sh. D. C. Jakhwal

Attachment 2

List of Participants

Sl. No.	Country/ Organisation	Name	Address
1	**Bangladesh**	Mr. Quazi Sarwar Imtiaz Hashmi	Deputy Director, Department of Environment Paribesh Bhaban, Room No. 402, E-16, Agargaon, Sher-E-Bangla Nagar, Dhaka-1207, Bangladesh Fax: 880-2-9118682/ 9113328 (Telefax) Email: hashmi@doe-bd.org
2		Mr. Syed Ahmmad Kabir	Assistant Bio-chemist, Department of environment Poribesh Bhaban, Boyiz, Khulna-1000, Bangladesh Email: syahkr11@yahoo.com
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Attachment 3

Group Laboratory Analysis: QC programme on Ionic balance

			BATCH A		BATCH B		Reference value	
S.No	Parameters	Unit	Sample A	Sample B	Sample A	Sample B	Sample A	Sample B
1	Na	mg/l	9.2	4.9	9.2	4.9	9.0	5.0
2	K	mg/l	18.4	21.3	18.4	21.3	18.0	21.0
3	Ca	mg/l	21.6	14.4	20.0	14.4	22.0	14.0
4	Mg	mg/l	9.6	5.8	10.3	20.4		
5	Chloride	mg/l	28.0	18.0	14.8	110.0		
6	SO4	mg/l	36.0	22.0	18.0	45.0		
7	NO3	mg/l	5.6	6.5	6.0	6.7		
8	HCO3	mg/l	275	98	79	256		
9	Na	meq/l	0.400	0.214	0.400	0.214		
10	K	meq/l	0.471	0.545	0.471	0.545		
11	Ca	meq/l	1.08	0.72	1.00	0.72		
12	Mg	meq/l	0.79	0.47	0.84	1.67		
13	Cl	meq/l	0.79	0.51	0.42	3.10		
14	SO4	meq/l	0.75	0.46	0.38	0.94		
15	NO3	meq/l	0.09	0.10	0.10	0.11		
16	HCO3	meq/l	4.50	1.60	1.30	4.20		
17	Total Cations	meq/l	2.737	1.951	2.715	3.152		
18	Total anions	meq/l	6.129	2.670	2.189	8.344		
19	Cations /Anions ratio	_	0.45	0.73	1.24	0.38		
20	% deviation of Cation vs Anion (R1)	%	-38.25	-15.57	10.73	-45.17		

Attachment 4

Summary & Conclusions

Monitoring Training Programme and Refresher Course

at

Central Pollution Control Board (CPCB), Delhi

March 16-19, 2009

for

Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia

Concluding Remarks

Key Objectives:

- Assess status of Malé monitoring sites
- Report on inter-laboratory comparison of rain water analysis
- Report on data quality and analysis
- Training in monitoring and analytical procedures
- Development of Standard Operating Procedures (SOP) Manuals

Other activities:

- Sharing of information
- Information on CPCB activities and facilities
- Prioritization of Phase IV implementation activities
- Shopping and sightseeing!

Assess status of Malé monitoring sites

Country reports and audits by MoC revealed:

- Deionised water should be recommended to avoid problems with distilled water (e.g. ammonium)
- Some measurements made but not reported (e.g. pH)
- Met. stations sometimes available but data not reported
- SO_2 and NO_2 measurements with HVS bubblers is no longer a requirement of Malé Monitoring Stations
- Some sites have been moved to improve security/electricity supply etc
- Need to ensure rain collectors have enough capacity for peak events (10 litre bottles) and are weather proof
- Wet only collectors are not all functional and handling of passive samplers and blanks improved
- SOP manual not available at sites in appropriate language
- Good news - some countries are adding new sites **:o)**

Assess status of Malé monitoring sites

Potential improvements for the future:

- Annual audits and improved communication with MoC
- SOP and manuals available and in appropriate language
- Met. Data available for all sites
- Battery operated low volume samplers for PM_{10} and $PM_{2.5}$ measurements
- Add passive samplers for NH_3 and HNO_3

Report on inter-laboratory comparison of rain water analysis

Dr Kim Oanh's report revealed:

- Second inter-comparison was an improvement on the first :o)
- Still strong bias for most of the parameters, especially for low conc. sample
- Results of parameters requiring less sample treatment are more accurate (e.g. EC and pH)
- Large number of unreported data (69/80 2nd versus 56/80 1st attempt)

Report on inter-laboratory comparison of rain water analysis

Dr Kim Oanh's report revealed:

-Detection limit reported by most labs.; none in 1st attempt!

- Only one BDL in low conc. level. 2nd attempt
- Only 5 labs have enough data points to compute R1 and R2 but only one lab reported it (none in 1st)
- Some labs. have not reported data in the Malé Declaration template
- Some labs did not report triple sample analysis results
- a lab reported not enough sample for repeated analysis (methods?)

Report on inter-laboratory comparison of rain water analysis

Dr Kim Oanh's report recommends:

- Labs. Should strictly follow Malé Declaration protocol and SOP

-Standard reference material should be provided to calibrate the measurement methods;

- Blanks should be determined and used to correct results

- pH and EC s measurements should be conducted at 25 degrees C and as soon as possible

- Lab./NIA should check their data before sending it to UNEP/AIT e.g.:

(a) Obvious errors should be removed

(b) Calculate precision (standard deviation)

(c) Should calculate R1 and R2 and look at EC measurement to see if it makes sense

Report on data quality and analysis

Comments on Dr Parwana's report:

- Good start but improvements on data quality required;

- Countries need to report on the Malé Declaration template provided;

- QA/QC procedure should be reported at front of report;

- Report on Data Quality Objectives (DQO) for Accuracy (≤ ±15%), Precision (≤ ± 15%), Precipitation (≥ 90%), Completeness (≥ 80% - precipitation and passive sampler; at least 4 valid PM_{10} samples/month);

- Terminology and units need to be standardised;

- Mean should be reported with standard deviation;

Report on data quality and analysis

Comments on Dr Parwana's report cont.:

- Decimal places should match accuracy of methods;

- Show detection limits;

- Seasonal means important as well as annual means;

- Match units used to those used for reporting impacts;

- A glossary is required;

- Report should include a comparison between rain volume collected by bulk sampler and data from nearest Met. Site.

Report on data quality and analysis

Dr Parwana's recommendations:

- For the results to be useful the site selection, monitoring, analysis and reporting need to be standardized;

- Adequate and capable manpower must be provided;

- Frequent change in staff must not take place – not more than 25% of staff must be changed at a time;

- Longer hands–on training must be provided within the countries followed by frequent visits (refresher course) by trainers/experts at least once in 6 months;

- Regular Instrument care, maintenance must be ensured;

- The ion concentrations should be reported in **mg/litre** instead of **µmol/litre** to keep a check on calculation errors;

Report on data quality and analysis

Dr Parwana's recommendations cont.:

- Proper maintenance of site records and observations;

- SOPs to be followed strictly;

- In-house QA/QC capability must be developed within each country;

- The project officer in charge of the respective countries must scrutinize the data and take corrective measures;

- Incorrect data must not be reported;

- Continuous and regular scrutinising of data required;

- Above all the importance of following a uniform protocol must be realized.

Training in monitoring and analytical procedures

The following lab. Session were conducted by CPCB:

- Demonstration of HVS for PM measurement

- Rain water analysis (pH, EC, cations and anions)

- Computation of R1 and R2

Then an interactive session followed where countries each described the procedure followed to rest of group

This process identified common mistakes e.g. making sure instrument is stabilized before measurements are made; making measurements at correct temperature etc.

R1 and R2 calculation went well but concentrations used were higher than those in real life !

Development of Standard Operating Procedures (SOP) Manual

The countries will produce country specific SOPs based on the Malé Declaration template:

- Bangladesh in 3 months
- Nepal in 3 months
- Iran in 3 months
- India in 3 months
- Maldives will convey message and response in a week
- Sri Lanka in 3 months
- *CPCB will assist Bhutan*
- *Pakistan?*
- *Develop a flow chart to go on wall in labs. for each method in local language*

Other Objectives:

• Sharing of information

Excellent at this training and more interaction needed afterwards:

e.g. MoC annual country audits plus improved communication generally

e.g. in-country training with continuous follow-up

• Information on CPCB activities and facilities

A big thank you to CPCB for opening its arms

• Prioritization of Phase IV implementation activities

Feedback required by end of March for deadline with donor

• Shopping and sightseeing!

Let's go!

Observations

Familiar faces

• Malé Declaration is achieving continuity in the staff involved in monitoring activities in each country

• *Crucial to pass knowledge on when you get home to build your institution's capacity*

Impacts are happening in your region

• *You are making measurements that can be used by your policy makers to protect human health and the environment – so you can be heros!*

- *PM concentrations high enough to affect human health?*
- *Ozone concentrations in range that affect crop growth?*
- *Rainwater pH decreasing and acidic anion concentration increasing?*

Remember

Your region's staple diet……..DAL

D – Diligence

A – Accuracy

L - Linkages

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LETS PUT OUR HEADS TOGETHER

SEI

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Atmospheric Environment Programme

Attachment 5

Summary of the final program evaluation on Malé Declaration Training and Refresher Course

Question	Not at all	A little	somewhat	mostly	Completely
Overall objectives and content					
1. Were the objectives clear and precise			11%	67%	22%
2. Were the objectives attained?			33%	56%	11%
3. Was the content linked to the objectives?			22%	56%	22%
4. Was the content well structured?		11%	11%	78%	11%
5. Was the content presented clearly?			22%	78%	
6. Were your expectations of the training workshop fulfilled?			50%	50%	
Workshop Format					
7. Was the workshop format appropriate for the program and you as a professional?			22%	78%	
8. Did the workshop format help you to share your own knowledge and experience?		11%	22%	56%	11%
Logistics					
9. Was the training workshop venue adequate?			13%	63%	25%
10. Was the timing of the agenda comfortable?		33%	33%	22%	11%
11. Was the length of the sessions appropriate?		11%	67%	11%	11%
	Excellent	Good	Average	Unsatisfactory Poor	
12. Overall, how would you rate the training? Please circle one.		89%	11%		