

REPORT OF THE FIFTH REGIONAL TRAINING PROGRAMME AND REFRESHER COURSE UNDER THE MALÉ DECLARATION HELD AT UNEP RRCAP, THAILAND DURING 27 TO 30 MARCH 2007

BACKGROUND

The monitoring programme is a key element of the implementation of the Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia. Quality Assurance and Quality Control (QA/QC) is crucial in ensuring the quality of the monitoring programme and has been identified as a priority area. As part of the capacity building in QA/QC, four regional level training programme's have been held so far. In these programme's, participants from the countries are trained in the correct procedures for lab analysis and QA/QC checks. They also review the data collected from the Malé sites. The fifth Regional Training Programme and Refresher Course was held at UNEP RRCAP, Thailand, during 27-30 March 2007. The agenda is enclosed as Annexure1.

PARTICIPANTS

Thirteen participants from six countries attended the training programme. They were drawn from the agencies supporting the monitoring programme under the Malé Declaration. The list of participants and resource persons is given as Annexure 2.

PRESENTATIONS

Day 1: March 27

Session I: Progress

The inaugural session was facilitated by Mr. Mylvakanam Iyngararasan, Head, Early Warning, UNEP RRC.AP. After a round of self introduction, Mr. Iyngararasan made a introductory presentation on the status of the implementation of the Malé Declaration, its new institutional set up, an overview of the monitoring programme and the objectives of the refresher course. The presentation is enclosed as Annexure 3.

After the inaugural session, Iran, Nepal, Pakistan, Maldives and Sri Lanka made the Country Presentations. The status of monitoring activities in Iran was presented by Mr.Tooraj Hemati, Air Pollution Research Office, Environmental Research Center. He started with an overview of the driving factors for air pollution in Iran, the steps necessary for mitigation, the national response to the issue and the roles and capacities of the main players. The Malé monitoring site is located at the Chamsary region in Dehloran township, near to the Iran-Iraq border. They have attempted monitoring of all the recommended dry and wet deposition monitoring parameters. They have also conducted one month of automated air quality monitoring. The data collected so far was shown and he then mentioned some of the problems faced. Leaks in the PM10 sampling system have

been rectified, but they are unable to continue due to non-availability of a suitable power supply. They also face accuracy problems because of the low concentrations of SO₂ and NO₂. The plastic lid and funnel holders of the Wet Only Collector and the funnel of the Bulk Collector do not last long because of the harsh climate. Another problem is the low rainfall in the region. SO₂ and NO₂ monitoring is a challenge due to the need of specialised personnel, not available at the site. The plans for the future include: increase the number of monitoring stations, strengthen monitoring of fine particulate matter, set up regional air quality monitoring centers, monitor meteorological parameters, provide periodic training to the monitoring personnel, attempt on-line monitoring and attempt continuous monitoring in large cities. The presentation is enclosed as Annexure 4A.

Mr. Pradeep Dangol, International Centre for Integrated Mountain Development (ICIMOD), gave an overview of the monitoring programme in Nepal. The monitoring site is at Rampur, Chitwan. The instruments in use include: High Volume Sampler (HVS), Passive Sampler, Automatic Weather Station, Wet Only Collector and Bulk Collector. The HVS is used to monitor PM₁₀, RSPM, TSP, SO₂, and NO₂. The Passive Samplers are used for monitoring SO₂, NO₂ and O₃. The parameters monitored under Rain Water Chemistry include: water volume, pH, Conductivity, Temperature, Acidity, Alkalinity, Hardness, Sulphate, Potassium, Chloride and Nitrate. The Automatic Weather Station has problem with its data logger and is currently not in use. He showed the trends of parameters obtained from the HVS, Bulk Collector and Wet Only Collector. The Passive Sampler and HVS were giving conflicting results and this needs to be resolved. The other problems faced by the station include: 40 hrs/week of load shedding during dry season, lid crack of Wet Only Collector, battery breakdown of Wet Only Collector, and difficulties in traveling to the site. Nepal has expressed their wish to have additional stations at Pokhar (Hill) and Birganj (Terai) to study the altitudinal effect. The presentation is enclosed as Annexure 4B.

Ms. Nadia Aftab, Pakistan Environment Protection Agency (Pak-EPA), gave the updates of the monitoring activities in Pakistan. The monitoring station was shifted to Bahawalnagar, on the Indo-Pakistan border. It now includes an onsite Laboratory. Under an MoU with Pak-EPA, the Pakistan Meteorological Department (PMD) officials and staff look after the Laboratory and carry out the monitoring activities. The physical features and topography of the site was described. The installed equipments consist of: ambient air monitoring equipment for particulate matter, Passive Samplers, Bulk Collector and Wet Only Collector. Due to the limitations of the personnel employed at the site, in wet deposition they monitor Electrical Conductivity and pH only and with HVS they monitor the particulates only. SO₂, NO₂ and Ozone are monitored using Passive Samplers. The trends of monitored values from HVS, Wet Only Collector, Bulk Collector and Passive Samplers were presented. The plan for the next 4 years include the establishment of an Environmental Monitoring System across the country and using the data from it to support policy making. The presentation is enclosed as Annexure 4C.

Mr. Ibrahim Mohamed, Ministry of Environment, Energy and Water made the Maldives country presentation. The monitoring site is at Hanimadhoo Island, co-located with the ABC site. Under the Malé Declaration, the Passive Sampler and the Wet Only Collector

are in operation. They intend to start using the HVS and pH measurements. The meteorological parameters are monitored regularly by the ABC station and a local Met Observatory. The average monthly trends of SO₂ and NO₂ were also shown. The presentation is enclosed as Annexure 4D.

Mr. R.M. Kulasena, Central Environmental Authority (CEA) presented the progress in Sri Lanka. The monitoring site is at Galenbindunuweva, Dutuweva, in North Central Sri Lanka. The CEA is carrying out Passive Sampler based monitoring of sulphur dioxide and nitrogen dioxide levels on a monthly basis, while wet deposition monitoring is carried out weekly. Ozone monitoring using Passive Samplers started in December 2006 and two samples has been sent to IVL for analysis. Ambient Air Quality at the site was monitored using Automated Monitoring Equipment for a week each, during the North East and the South West Monsoon periods. The methodology used for lab analysis and the parameters was explained. The trends of SO₂, NO₂, rain water volumes and anion concentrations were presented. A new Project Manager has been appointed and they have made plans to continue the project for the next 4 years. They are planning to change the monitoring site, due to difficulty in accessibility, voltage drops and for better protection of the instruments. The presentation is enclosed as Annexure 4E.

Session II: Inter-laboratory comparison protocol

After the country presentations, Dr. Kim Oanh N. T, Asian Institute of Technology (AIT), presented an overview of the draft Protocol for the inter-laboratory comparison of Male's monitoring network. Dr. Kim started with the relevance of the inter-laboratory comparison programme and its objectives to ensure data quality and reliability. The main activities consist of: protocol preparation, artificial rainwater sample preparation, sending samples to laboratories, data acquisition, data handling, data analysis, reporting and dissemination, and recommendations to improve the data quality. 2 concentration levels (high and low) have been proposed for the analysis. She also explained the logistics, the precautions required, the procedures for data acquisition, data checking and data analysis. The outline of the QA program for the inter-lab comparison was also mentioned. The first attempt would be made during June-July 2007, and the second attempt during February-April 2008. The protocol would be later updated for further use in the network. After the presentation there was a discussion on the draft protocol and the inter-laboratory comparison and the preparedness of each country to start the inter-laboratory comparison programme was ascertained. All the countries confirmed that they would be prepared by the proposed starting date of June 2007. The presentation is enclosed as Annexure 5A and the draft protocol is attached as Annexure 5B.

Session III: Lab practice for rainwater sample analysis

In the afternoon, the lab practice sessions on rainwater sample analysis were initiated, which was spread over 3 half-day sessions on the first, second and third days. The practice was done at the Environmental Engineering and Management Research Lab in AIT. They were guided, supervised and helped by the lab personnel led by Ms. Salaya Phunsiri and Mr. Tin Win. To do the analysis they were divided into five groups. The

groups and their members are listed as Annexure 6A. Before proceeding to the lab for each practice session, the participants assembled at UNEP RRC.AP and Ms. Salaya gave a brief explanation of the steps to be followed. On the first day they analysed: pH and Electrical Conductivity; Chloride Determination by Titrimetric Method; and Hardness, Calcium and Magnesium Determination by Titrimetric Method. The introductory presentation by Ms.Salaya is attached as Annexure 6B.

Day 2: March 28

Session IV: Lab practice for rainwater sample analysis (continued)

In the morning, the participants continued to work in the lab on ammonia determination by titrimetric method and sulphate and nitrite determination by spectrophotometric method. The presentation by Ms.Salaya is attached as Annexure 6C.

Session V: Data Report and Data Analysis

In the afternoon, Ms.Karin Sjoberg from the Swedish Environmental Research Institute Ltd (IVL), made a presentation on how scientific work supported the development and implementation of air pollution policy in Europe. The air pollution strategies in Europe were driven by urban and transboundary air pollution issues. She made a quick scan of the developments in Europe, starting from the latter half of the 20th century. This included the discovery of air pollution impacts, the achieving of consensus among stakeholders, development and implementation of cost efficient strategies, and a return to a greater emphasis and analysis of the health impacts of air pollution. She highlighted the features of the LRTAP Convention and the various agreements and protocols that followed. Compared to 1980 levels, they have helped in overall reduction of sulphur dioxide by 70%, nitrogen oxides by 30%, ammonia by 25% and volatile organic compounds by about 35%. The conclusions from the baseline projections made by the Clean Air for Europe (CAFÉ) program, initiated by the European Commission in 2001, confirm the declining trend of emissions, but cautions that air quality remains a threat to human health and vegetation and that emission from ships will surpass land-based EU sources. The presentation is attached as Annexure 7.

Dr. Kevin Hicks, Stockholm Environment Institute (SEI) introduced the Integrated Assessment Model (IAM) being developed for the Malé Declaration, named as the Integrated Information and Assessment System (IIAS). The progress in the development of the model was presented and its current functionalities demonstrated. The IIAS serves as a way to integrate the different Malé Declaration activities, conduct further research and to provide additional information. He explained the need and importance of atmospheric modeling, and how it complements monitoring. Dr.Hicks demonstrated the use of IIAS, by presenting the example of sulphur deposition in South Asia, which was done using the EDGAR database on emissions and the MATCH model. This was compared with the values obtained by monitoring at the Malé stations. He showed that this approach could be used for the other pollutants for risk assessments, and to investigate various sub-regional and national scenarios. The participants were also

introduced to the HYSPLIT model (available online at NOAA's website) for air mass trajectories computations. He stressed that modelling and monitoring efforts should develop together and that the modelling results will improve when the Malé emission inventory replaces the use of international data. The presentation is attached as Annexure 8.

Dr. Maheswar Rupakheti, UNEP RRC.AP, presented an analysis of the 2007 Monitoring Data Report. He went through the data presented by the countries and highlighted their strengths and weaknesses. He stressed the importance of good quality data for good policy making. The points for improvement included: consistency in sampling intervals, need to mention detection limits and precision of instruments, avoidance of minor mistakes (like giving zero value for non-available data, no units mentioned, use of correct units etc), and the need to mention computation formula. He also reminded the participants to go through the comments made by IVL and to keep record of anything worth noting. The presentation is attached as Annexure 9.

Mr. Sagar Dhara, Member, Monitoring Committee, Malé Declaration, then gave his views on the 2007 Monitoring Data Report. To illustrate the importance of having the right data and information at the right time, and the capacity to interpret it, he highlighted the failures that occurred during some of the recent environmental and natural disasters that occurred in South Asia, including the 2004 Tsunami and the Bhopal gas tragedy. He then did a page by page analysis of the Data Report. The generic points mentioned were: standardize the date and time format; flag deviations from normal or data that requires further analysis; have consistent quantity of the sample; provide formats for solar insolation and wind speed; explore the possibility of providing a software for converting wind data to windrose; site name to be mentioned; avoid simple mistakes; need to mention units and use the right units. He also mentioned the specific strengths and weaknesses of the data.

Day 3: March 29

Session VI: Lab practice for rainwater sample analysis (continued)

The participants spent the morning in the lab, continuing their work with rainwater sample analysis of sodium and potassium by AAS. The introductory presentation by Ms. Salaya is attached as Annexure 6D.

Session VII: Passive Sampler Inter-comparison

In the afternoon, Dr. Rajasekhar Bala, National University of Singapore, presented the proposed Passive Sampler Inter-comparison study for the Malé Declaration, to compare the performance of different designs of Passive Samplers. He gave a brief introduction about Passive Samplers, the different types, features, and their advantages. The options available to the Malé Declaration is to have a laboratory in the region to analyse indigenous /commercial Passive Samplers or to conduct studies to find suitable alternative Passive Samplers that can be produced and analysed in the region. The

Passive Sampler design, the chemical absorbent used and the quality of the laboratory analysis are important for obtaining good results. The proposed study will have two main components: implement Passive Sampler inter-comparison; and compare Passive Samplers with active samplers. The experiment is scheduled to start from June 2007. NUS would lead the study, while UNEP RRC.AP and SEI would help NUS in developing and facilitating the study. Following the presentation, there was a brief discussion on the proposed methodology. The presentation is attached as Annexure 10.

Session VIII: QA/QC

Dr. Prapat Pongkiatkul from AIT, led a session on the statistical analysis of the results from the lab practice. He introduced the different concepts in statistic analysis such as frequency distribution, measures of central tendency (Arithmetic Mean, Geometric Mean, Median, Mode), measures of dispersion(Standard Deviation, Normal Distribution), precision, accuracy, absolute and relative methods for expressing precision, errors, classes of errors and the propagation of errors. He later introduced the simpler features of the SPSS software, which generates the statistical analysis with more ease. The participants were made familiar with the concepts and the softwares(Excel and SPSS), by doing simple exercises using the data obtained from the lab analysis. The presentation is attached as Annexure 11.

Towards the end of the day, Mr.Sagar Dhara trained the participants in doing QA/QC checks. Each group had to estimate the R1 and R2 values of the results of their lab analysis and later present the values. He stressed the understanding of fundamentals such as equivalence and the use of correct units. This session helped the participants in understanding basic concepts required for ensuring better quality lab analysis.

Day 4: March 30

Session IX: QA/QC (continued)

In the morning session, the participants continued working on estimating the R1 and R2 values, under the guidance of Mr.Sagar Dhara. At the end, each group presented their values and Mr.Sagar Dhara helped them correct and interpret the results.

Session X: Planning for Phase IV

Mr.Mylvakanam Iyngararasan then took the lead to discuss the recommendations of the IG8 and the proposed responses to them. After the discussions, the meeting recommended specific responses for the IG8 recommendations, as given in Annexure 12.

Mr.Iyngararasan then presented a tentative outline for Phase IV implementation of the Malé Declaration. He reminded the participants of the long term goal of the Malé Declaration to aid the process of providing a clean environment through clean air. He then went on to specific objectives and activities that could be carried out during Phase

IV. After the discussions, the meeting recommended specific activities for Phase IV implementation, as given in Annexure 13.

Session XI: Closing

After lunch, the acclaimed documentary film on Climate Change, “Inconvenient Truth” was shown for the benefit of the participants. Before showing the film, Mr.Sagar Dhara gave an overview of the film and its relevance in the current scenario.

The concluding session started after the film show, presided by Mr.Surendra Shrestha, Regional Director, UNEP. The different groups presented the results of their lab analysis and their estimation of R1 and R2 values. They also indicated the support required for ensuring better quality lab analysis. The group presentations are attached as Annexure 14A to 14E. Mr.Shrestha then presented the certificates to the participants. Making his concluding remarks, he congratulated the participants and thanked the resource persons and Sida. He reminded that both Climate Change and air pollution issues are now occupying the centre stage of global deliberations. Many events will take place this year in Asia, including the COP meeting in Bali, stressing the centrality of Asia in these issues. Sound science and information is required to support these efforts. The work of the Malé monitoring network is important in providing good quality data. On behalf of the participants, Mr. Abdul Muhusin Ramiz, Department of Meteorology, Maldives and Mr. Masood Zandi, Environmental Research Center, Republic of Iran, expressed their thanks to the organizers and resource persons.

TRAINING WORKSHOP EXPERIENCE AND EVALUATION

There was active involvement of the participants in the workshop and emphasis was given to practicing the concepts, with most of the time spent on lab analysis and their analysis. On the last day of the workshop, an evaluation form was filled in by the participants. The summary of the responses is given in Annexure 15. The participants were happy with the course, especially due to the well-instructed hands on training. The major complaint has been the lack of time. There were suggestions to have training using other methods too, especially less labour-intensive ones.