Report of the second Training Workshop on "Emission inventory preparation / scenarios / atmospheric transport modelling workshop" under the Malé Declaration held at UNEP RRCAP, Bangkok, Thailand during 26 February to 2 March 2007

Background

"Emission inventory preparation and Integrated Assessment Modeling" was one of the priority areas identified for capacity building under Phase III implementation of the Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia.. The first training workshop on emission inventory, emission scenario, and modeling was held in Bangkok during 3-8 July 2006. This report summarises the proceedings of the follow-up training held at UNEP RRCAP, Bangkok, Thailand during 26 February to 2 March 2007. The agenda is enclosed as Annexure1.

Participants

Fourteen participants from seven countries attended the training workshop. Eleven of the participants had attended the first workshop and three were new. They were drawn from the Government agencies dealing with environment and meteorology. The list of participants and resource persons is given as Annexure 2.

Presentations

Day 1: February 26

The presentations on the first day, started with an introduction to the workshop and its objectives by Mr. Mylvakanam Iyngararasan, Head, Early Warning, UNEP RRC.AP and Dr.Johan Kuylenstierna, Director, Stockholm Environment Institute – York(SEI-Y). This was followed by a round of self introduction and enquiring about the participants expectations from the workshop.

After the inaugural session, Dr. Harry Vallack, SEI-Y, started his sessions on emission inventory which covered day 1 and day 2. In the first session he introduced the participants to emission inventories and how to work with the emission inventory worksheet developed for the project. This was a revision of the subject covered in the first workshop, mainly for the benefit of the new participants. The presentation is attached as Annexure 3 A and B. The updated Emission Inventory worksheet (version 2.3) is attached as Annexure 4 A and the manual is in Annexure 4 B.

This was followed by country presentations from Pakistan, Sri Lanka, Iran and Bhutan. The participants presented the major findings of the emission inventory they had carried out since the first workshop. The data collated from a variety of sources, were summarized in terms of absolute values/percentage shares of the pollutants and their sources. The participants highlighted the challenges faced by them in getting data and information, especially in the form required to be input into the emission inventory worksheet. Pakistan raised the issue of lack of data for the sub-sectors within major sectors, like industry. Iran had problems with estimating the emissions from the Brick Kilns. The discussion that ensued addressed these doubts and the need for systematic and continuous improvement of the emission inventory. A common point stressed was the need to ensure long term sustainability of this capacity building effort by institutionalizing the expertise within the country. The country presentations are attached as Annexure 5 A to 5 D.

In the last session of the day, the methodology for accounting emissions from Large Point Sources(LPS) was taken up. The need for a separate methodology for LPS and the data required were explained. The learning was followed by two exercises titled “Filling in test data for –Large Point Sources (LPS)” and “Inserting extra LPS into workbook”. The exercises helped the participants become familiar with using the Malé Declaration Emission Inventory worksheets. The presentation and the exercises are attached as Annexure 6 A, 6 B and 6 C.

Day 2: February 27

The first item of the day was the country presentation by Nepal. Nepal, as well as other countries, had difficulty in estimating emissions from forest fires. The presentation is attached as Annexure 5 E. The participants were then introduced by Dr.Vallack on how to work with energy data from the International Energy Agency(IEA). The conventions used in the IEA data and how to extract the IEA data for the Malé Declaration Emission

Inventory, was the main theme. The participants were given 2 exercises titled "Filling in data for –Combustion Activities in Energy Industries and Manufacturing Industries and Construction" and "Filling in data for – Fugitive emissions for fuel". Dummy data in IEA format was used in these 2 exercises. The exercises and the data are attached as Annexure 7 A,B and C.

In the afternoon session, Dr. Harry Vallack spoke about Quality Control and Quality Assurance (QA/QC) for the Emission Inventories being prepared. QA/QC checks is needed for transparency, accuracy, completeness, consistency and comparability of the inventories. He then detailed the QA/QC checks and priorities. Updates made in the Malé Declaration Emission Inventory worksheet were also mentioned. The presentations are attached as Annexure 8 A and 8 B and an application exercise is given as Annexure 8 C.

Day 3: February 28

The third day started with the sessions on Emission Policy and Scenarios by Dr.Philip Peck, IIIEE, University of Lund, Sweden. He first presented the summary of the results of the online evaluation he had done among the participants of the first training workshop on emission inventory, emission scenario, and modeling, in 2006. The feedback gave insights about the direction in which the work on Emission Scenarios needs to proceed and the capacity building needs. The introductory presentation is attached as Annexure 9 and the evaluation is attached as Annexure 9 B.

Dr.Peck then gave a brief review of policy instruments for air pollution prevention and control. He explained and gave examples for policy options with command and control, economic/market-based instruments, information based instruments, voluntary agreements and options related to infrastructure and public services. The challenge of choosing the appropriate mix of policy options from among these was highlighted. The presentation by Dr.Peck is attached as Annexure 10 A. The draft Chapter 3 of the Handbook on Policy Options for Air Pollution Prevention and Control in South Asia was also provided to the participants and this is attached as Annexure 10 B.

The participants were then split into four groups, for doing group exercises on Policy and Scenarios. The four groups focused on four issues: Group 1 on Large point sources: power sector, Group 2 on transport sector: private vehicles, Group 3 on transport sector: public transportation & trucks and Group 4 on Informal sector: brick kilns. The four exercises were introduced to the participants, before they started working on it. 5 policy options were given to each group, from which they had to evaluate each policy option according to a range of criteria such as: enforceability, appropriateness, predictability, persistence, flexibility, economic efficiency, cost-effectiveness, administrative burden and costs, legitimacy and transparency. The Exercise is given in Annexure 10C and the Evaluation Grid is given in Annexure 10 D. In the afternoon, the groups presented their findings, followed by discussions. The group presentations are given as Annexure 10 E to H.

The last session for the day was given by Dr.Peck on "Conducting simple Emission Scenarios ". He defined Emission Scenarios and explained its relevance in Integrated Assessment Modelling (IAM) and its linkage with other components of the IAM, such as Emission Inventories.The top-down socio-economic and the bottom-up technology based approaches were explained and differentiated. Dr.Peck then went into more details of the technology based approach, where activity rates, emission factors and technology penetration rates are important. Some simple examples of scenarios were given and the commonly used modelling tools were introduced. The presentation is given as Annexure 11 A. The draft version of the Manual for the development of Emission Scenarios for Air Pollution Prevention and Control in South Asia was provided to the participants and this is attached as Annexure 11 B.

Day 4: March 1

Continuing from the previous day's session on Emission Scenarios, the participants were introduced to an exercise on emission scenarios, using the SIM-AIR software. Dr.Peck gave a brief introduction to SIM-AIR. The model and its manual are attached as Annexure 11 C and 11 D. The exercise was on a case for which the future emissions from the transport sector were to be estimated. The participants were also required to build alternative policy scenarios and optimise air pollution prevention and control measures. The Exercise is attached as Annexure 11 E. At the end of the session, the participants discussed their findings.

In the afternoon session, Dr.Johan Kuylenstierna, SEI-Y, introduced the Integrated Assessment Model (IAM) being developed for the Malé Declaration, named as Integrated Information and Assessment System (IIAS). Dr.Johan was assisted by Ms. Pwint Phyu Aung from UNEP RRC.AP. 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. Dr.Johan 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. He showed that this approach could be used for the other pollutants also for risk assessments, and to investigate various sub-regional and national scenarios. The presentation is attached as Annexure 12.

The last session of the day was on the MATCH model by Dr.Magnuz Engardt, Swedish Meteorological and Hydrological Institute (SMHI). The MATCH model, developed by SMHI, could be used for research, emergency preparedness or environmental assessments. It is an Eulerian model, with algorithms embedded for chemical conversion, deposition and atmospheric transport and dilution. The meteorological data is taken from an auxiliary driver. Dr.Engardt decribed the chemistry schemes presently available in the MATCH model for inert species, sulphur, sulphur/nitrogen, ozone and particles. The model simulation time depends on the number of grid boxes, number of advected species and the chemistry scheme. He then described the deposition processes, boundary layer processes and the advection scheme in MATCH. The presentation is attached as Annexure 13.

Day 5: March 2

The first session of the final day was by Dr.Magnuz Engardt on the input data needed for the MATCH model. The input data required includes: 3-dimensional meteorology, emission source details, details of the surface physiography and boundary fields. The relevance of each input data and the various options to optimize the model's performance were also described. To illustrate the performance of the model, examples of the application of the model was shown. The presentation is attached as Annexure 14.

In the next session, Dr.Engardt detailed the hardware and software of the MATCH model and demonstrated its operation. MATCH is written in FORTRAN and C, and runs on Linux, Solaris PCs and Unix workstations. It has no graphical interface and its input and output data needs to be converted to suitable format to be able to analyse or modify it. Details regarding its running, set-up modification and results processing were also discussed. The presentation is attached as Annexure 15.

The closing ceremony was held before lunch. Mr.Surendra Shrestha, Regional Director, UNEP, distributed the certificates to the participants. Mr.Mylvakanam Iyngararasan summarised the recommendations that came up through this workshop for future work on the IIAS and its components.

Next Steps

A summary of the recommendations on the issues for Phase IV (May 2008 – May 2011), was circulated and discussed. This is attached as Annexure 16. For emission inventories, it was suggested that there be peer review of the work among the 8 country teams and that the inventories be updated with 2005 data. The uncertainties in the Malé inventory worksheet needs to be progressively reduced. Some of the suggestions for this were: allocation matrices to be incorporated to allow temporal and spatial disaggregation of data, refining the methodology for road transport emissions for making it more generic and based upon engine technology, inclusion of methodologies to help estimate activity variables for different sectors, estimation of suitable default emission factors, especially for PM2.5, estimation of areas of vegetation burnt, and speciation of NMVOCs into reactivity classes. The specific areas/sectors for which methodologies need to be developed were forest / vegetation fires, road transport, small scale industries (e.g. brick kilns) and natural emissions. It was suggested to incorporate a new projections/scenarios option module within the workbook and to assess the existing emission reduction policies in the countries. For the IIAS and atmospheric transport modeling, the suggestions were: development of online version of IIAS, continual updating and refinement of MATCH model inputs in collaboration with participating countries, and capacity building efforts.

More specialized projects from the region and the documentation and compilation of data is essential for refining the model.

Training Workshop Experience and Evaluation

There was active involvement of the participants in the workshop and emphasis was given to practicing the concepts, with over fifty percent of the time spent on exercises and case studies. 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 17. The evaluation shows that the participants were satisfied with the training. The main suggestion from them was to have more practice oriented sessions in modeling, since most of them were unfamiliar with modeling.