

The Eighth Session of the Scientific Advisory Committee
of the Acid Deposition Monitoring Network in East Asia
15-17 October 2008, Hanoi, Viet Nam

Report on the activities of the Expert Group on Dry Deposition Flux Estimation

Chair of the Expert Group

I. Background

1. One of the tasks of the Task Force on Dry Deposition Monitoring established by the Interim Scientific Advisory Group (ISAG) in 2000 was to discuss and elaborate on a future strategy on dry deposition monitoring for EANET. The second edition of the Strategy Paper for Future Direction of Dry Deposition Monitoring of EANET prepared by the Task Force was endorsed by the Scientific Advisory Committee (SAC) in September 2005. This document presents the status quo of dry deposition monitoring, a revised list of major chemical species for dry deposition monitoring in EANET and included a step-by-step future strategy on dry deposition monitoring. However, it did not identify a method for estimating dry deposition flux in the EANET region.
2. The “Strategy on EANET Development **(2006-2010)**” which was endorsed by the Eighth Session of the Intergovernmental Meeting (IG8) in 2006 has included the following activities and expected outcomes:
 - *Development and application of monitoring methods for dry deposition considering current country-specific monitoring methodology*
 - Technical Manual for dry deposition fluxes estimation prepared by Task Force on Dry Deposition Monitoring **(2008-2010)**
 - Estimation of dry deposition fluxes at the selected monitoring sites **(2009-2010)**
3. The Seventh Session of Scientific Advisory Committee of the EANET (SAC7) in October 2007 recommended to IG the establishment of an Expert Group on Dry Deposition Flux Estimation under the existing Task Force on Dry Deposition Monitoring to develop a method for estimating dry deposition fluxes in the EANET region and produce a Technical Manual on Dry Deposition Flux Estimation. This was endorsed by the Ninth Session of the Intergovernmental Meeting (IG9) of the EANET in November 2007. SAC7 also appointed Dr. Pojanie Khummongkol as the chairperson of the expert group and the Network Center (NC) was designated as the secretariat.

II. Activities

II-1. First meeting of the Expert Group

4. In early 2008, the NC as the secretariat of the Expert Group sent an appointment letter to all the nominated members to confirm their acceptance, according to a suggestion of the Chair.
5. The first meeting of the Expert Group was held at ADORC (Acid Deposition and Oxidant Research Center) from 23 to 24 June 2008. The minutes of the meeting are attached as Annex 1.

II-2. Terms of reference (TOR) of the Expert Group

6. The Expert Group agreed to recommend the following Draft Terms of Reference for the consideration of the SAC:
 - To review existing researches of direct measurement and inferential method for estimation of dry deposition flux
 - To select monitoring sites where estimation by inferential method or direct method could be implemented
 - To evaluate the inferential method by using direct measurement results in and outside of EANET region
 - To prepare a Technical Manual for dry deposition flux estimation
 - To identify future research activities on dry deposition

II-3. Members

7. The meeting also agreed on the following members of the Expert Group:

Dr. Pojanie Khummongkol (Chairperson)	Associate Professor, King Mongkut's University of Technology Thonburi, Thailand
Dr. Hong You-Deog	Senior Researcher, National Institute of Environmental Research, Republic of Korea
Dr. Kazuhide Matsuda	Associate Professor, Meisei University, Japan
Dr. Kentaro Hayashi	Senior Researcher, National Institute for Agro- Environmental Sciences, Japan
Dr. Akira Takahashi	Senior Research Scientist, Central Research Institute of Electric Power Industry, Japan
Dr. Hiromasa Ueda	Director General, Acid Deposition and Oxidant Research Center, Japan

II-4. Major decisions at the first meeting of the Expert Group

8. Discussions in the first meeting of the Expert Group were summarized as the meeting minutes (Annex 1). The major decisions of the first Meeting are as follows:

- The Meeting agreed to invite Dr. Jan Willem Erisman (Energy Research Center of the Netherlands) and/or Dr. Tilden P. Meyers (National Oceanic and Atmospheric Administration), who are well known internationally for their research on dry deposition flux, to the second meeting of the Expert Group to provide comments and additional inputs to the draft Technical Manual on Dry Deposition Flux Estimation, subject to availability of financial resources.
- The meeting agreed to make the following recommendations to the Task Force on Dry Deposition Monitoring and SAC:

i) Method for estimation of dry deposition flux for EANET

The Expert Group recommended the inferential method to be applied for determining dry deposition in the participating countries of EANET based on the calculated dry deposition velocity (V_d) that is composed of R_a (Aerodynamic resistance, Erisman & Draaijers, 1995), R_b (Quasi-laminar layer resistance, Erisman & Draaijers, 1995) and modified R_c (surface resistance, modified by Dr. Matsuda) parameters.

ii) Preferred monitoring sites for field studies

The Expert Group recommended sites with the following features:

(Topography and Land Use)

- relatively flat land
- remote or rural site
- forest
- agricultural land
- grassland

(Climatology)

- tropical
- sub-tropical
- temperate
- boreal
- arid

iii) Reporting of dry deposition flux

The Expert Group recommended the reporting of dry deposition fluxes in the annual

EANET Data Report.

iv) Future research projects for improvement of estimation method for dry deposition

The Expert Group recommended the following research projects for improvement of estimation method for dry deposition:

- a) Aerosol deposition study to forests by both direct and indirect methods
- b) Ammonia deposition flux estimation by both direct and indirect methods
- c) Flux estimation model inter-comparison
- d) Flux estimation model inter-comparison with field observations

v) Validation of the Inferential Method

The Expert Group recommended the use of the following direct measurements to validate the Inferential Method:

- Gradient method
- Bowen method
- Eddy correlation method

vi) Technical Manual on Dry Deposition Flux Estimation

The Expert Group recommended the Technical Manual to include the items listed in the Table of Contents of the Technical Manual on Dry Deposition Flux Estimation (Annex 1).

- The meeting further agreed to designate the lead authors for the respective sections of the Technical Manual. Members agreed that the first draft document of the Technical Manual shall be ready for discussion at the second meeting.
- The second meeting will be held in February or March, 2009.
- More research efforts on dry deposition flux estimation are required due to many uncertainties in estimation of dry deposition. The Expert Group members will continue their research projects on the basis of field investigation and make efforts to apply for research funds on their existing sites as well as for regional scale projects.

II-5. Schedule

9. The Expert Group agreed to follow the following time schedule for its activities:

May 2008

Appointment of the membership of the Expert Group

<u>23 – 24 June, 2008</u>	First meeting of the Expert Group, Review of current researches on dry deposition
<u>July, 2008 – January, 2009</u>	Preparation of the first draft of the Technical Manual
<u>February or March, 2009</u>	Second meeting of the Expert Group to discuss about the first draft of the Technical Manual
<u>At SAC9 (autumn 2009)</u>	Submission of the draft Technical Manual to SAC for comments
<u>Middle of 2010</u>	Third meeting of the Expert Group to finalize the Technical Manual
<u>At SAC10 (autumn 2010)</u>	Submission of the Technical Manual to SAC for adoption

II-6. Follow-up actions from the first meeting

10. The NC sent the format and guidelines for preparation of the “Technical Manual on Dry Deposition Flux Estimation” to the authors in early October 2008. The first draft of the Technical Manual is due on 31 January 2009. The NC will compile the drafts submitted by the authors for discussion at the second meeting that will be held in February or March, 2009.
11. The Expert Group meeting and information on the follow-up activities were reported to the Chairperson of the Task Force on Dry Deposition Monitoring. As the Task Force on Dry Deposition Monitoring will only hold its first meeting on 14 October 2008, this information could not be reported to all its members.
12. At the request of the Task Force on Research Coordination, the Chair of the Expert Group had prepared a concept paper on “Aerosol deposition studies in forests for improvement of estimation method for dry deposition” (Annex 2). The Task Force on Research Coordination will submit the concept papers of 3 high priority research projects to SAC for its consideration. It is proposed that the projects to be funded using EANET budget in 2009.

III. Recommendations to SAC8

13. The Eighth Session of the Scientific Advisory Committee of the EANET (SAC8) is invited to consider the report on the activities of the Expert Group on Dry Deposition Flux Estimation of the EANET by the Chair of the Expert Group and endorse the following:
 - i) The TOR of the Expert Group on Dry Deposition Flux Estimation
 - ii) Membership of the Expert Group on Dry Deposition Flux Estimation

14. SAC8 is also requested to note:

- i) The Inferential Method recommended for estimation of dry deposition flux for EANET
- ii) The preferred monitoring sites for field studies
- iii) The proposal to report the dry deposition flux in the annual Data Report
- iv) The future research projects recommended for improvement of estimation method for dry deposition
- v) The measurements recommended for validation of the Inferential Method

15. The Session is also invited to review and endorse the items listed in the Table of Contents of the Technical Manual on Dry Deposition Flux Estimation (Annex 1).

ACID DEPOSITION MONITORING NETWORK IN EAST ASIA (EANET)

FIRST MEETING OF THE EXPERT GROUP ON DRY DEPOSITION FLUX ESTIMATION OF THE TASK FORCE ON DRY DEPOSITION MONITORING SCIENTIFIC ADVISORY COMMITTEE (SAC) OF EANET

(Niigata, 23-24 June 2008)

PROVISIONAL AGENDA

June 23

09:00-09:15

1. Welcome remarks Mr. Nitta (NC)

09:15-09:30

2. Overview of the Task Forces and Expert Groups Ms. Leong (NC)

09:30-09:45

3. Introduction Chair

09:45-10:00

4. Draft terms of reference and membership of the Expert Group Dr. Sato (NC)

10:00-10:30 Coffee Break

10:30-11:00

5. Draft terms of reference and membership of the Expert Group Discussion

11:00-11:30

6. Current status of EANET air concentration measurements Dr. Sato (NC)

11:30-12:00

7. Presentation for current research on dry deposition Dr. Matsuda

12:00-14:00 Lunch

14:00-14:30

Presentation for current research on dry deposition Dr. Hayashi

14:30-15:00

Presentation for current research on dry deposition Dr. Takahashi

15:00-15:30

Presentation for current research on dry deposition Dr. Pojanie

15:30-16:00

Presentation for current research on dry deposition Dr. Hong

16:00-16:15	Coffee Break	
16:15-17:15		
8.	Draft Table of Contents for the Technical Manual on Dry Deposition Flux Estimation	Discussion
17:15	Departure to the hotel	
 <u>June 24</u>		
09:00-09:30		
	Presentation for current research on dry deposition	Dr. Ueda
09:30-10:30		
9.	Summary of presentations and discussions	Discussion
10:30-11:00	Coffee Break	
11:00-12:00		
10.	Contents of the Technical Manual Lead authors and contributions	Discussion
12:00-14:00	Lunch	
14:00-16:00		
11.	Next steps and schedule	Discussion
16:00	Close	

MEETING MINUTES

I. Agenda

The Meeting followed the issues as listed in the Provisional Agenda.

II. Welcome Remarks

Mr. Akira Nitta, Deputy Director General of ADORC, on behalf of the Director General welcomed the members of the Expert Group on Dry Deposition Flux Estimation of the EANET Scientific Advisory Committee to ADORC, Niigata, Japan.

III. Overview of the Task Forces and Expert Groups

Ms. Leong Chow Peng, Deputy Director General of ADORC presented an overview of the Task Forces and Expert Groups formed under the Scientific Advisory Committee of EANET.

IV. Introduction

Dr. Pojanie Khummongkol, the chairperson of the Expert Group, made introductory remarks. The chairperson informed members on their responsibilities to recommend a standard method for calculating dry deposition flux so that the total deposition of the important acidic species in the region could be estimated. The Expert Group was also required to develop a Technical Manual describing this methodology to assist member countries to calculate amount of acid deposition in their own country.

V. Draft terms of reference and membership of the Expert Group

The Secretariat presented the draft terms of reference and membership of the Expert Group. The meeting discussed the draft terms of reference and agreed to adopt the Revised Draft Terms of Reference as attached (see Annex 1) and agreed on the list of members (see Annex 2). Although the present members are sufficient to carry out the tasks given to the Expert Group, it might be beneficial to invite some experts from outside of EANET to provide comments and additional inputs to the draft Technical Manual on Dry Deposition Flux Estimation. The Meeting therefore agreed that Dr. Jan Willem Erisman (Energy Research Center of the Netherlands) and/or Dr. Tilden P. Meyers (National Oceanic and Atmospheric Administration) be invited as resource persons to the second meeting of the Expert Group.

VI. Current Status of EANET Air Concentration Measurements

The Secretariat presented the current status of EANET air concentration monitoring activities. The meeting was informed that NC will make efforts with participating countries to increase the number of sites monitoring air concentrations, and further encourage countries to submit meteorological data at the EANET sites as these data are necessary to estimate dry deposition flux.

VII. Presentation for current research on dry deposition

Dr. Kazuhide Matsuda

Dr. Matsuda made a presentation on "An estimation for sulfur and nitrogen dry deposition in Japanese EANET sites". He informed that:

- i) A case study of dry deposition estimation at EANET observation sites in Japan was conducted using the Inferential Method;
- ii) The revised Inferential Method has been currently developed by using resistance parameters of Ra (Erisman & Draaijers, 1995), Rb (Erisman & Draaijers, 1995) and modified Rc (modified by Dr. Matsuda) for forests and grass;
- iii) It is necessary to select suitable sites, set up the criteria, and expand meteorological observations to establish dry deposition velocity in order to improve the estimation of dry deposition flux using the Inferential Method.

Dr. Kentaro Hayashi

Dr. Hayashi made a presentation on "Dry deposition of nitrogen species with special emphasis on ammonia". He informed that:

- i) More than 50% of N deposition was originated from dry deposition at turf grassland in central Japan;
- ii) Ammonia markedly contributed to N deposition (25% of total deposition);
- iii) Paddy field was a net sink of ammonia in general due to non-intensive fertilization (conventional style in Japan);

- iv) Manure application to the paddy field induced a remarkable ammonia emission. Relevant studies are still insufficient;
- v) The dry deposition flux of ammonia by direct measurement should be considered because of the ammonia emission from land surface.

Dr. Akira Takahashi

Dr. Takahashi made a presentation on "Estimation of Deposition Velocities of Fine Particles". He informed that:

- i) Estimated deposition velocities of fine particles (<2.5 μm) by gradient method were three times as large as those estimated by the empirical formula which is used in the acid deposition model;
- ii) The estimated deposition velocities were affected by vaporization of NH_4NO_3 ;
- iii) Mean values of obtained deposition velocities by gradient method were consistent with those reported for the forests in the United States and Europe;
- iv) The most appropriate method should be determined for estimating the deposition velocity of particulates in East Asia.

Dr. Pojanie Khummongkol

Dr. Pojanie made a presentation on "Current Research on Dry Deposition Flux". She introduced the direct measurements performed in Thailand and informed that:

- i) Surrogate surface method for direct measurement can be used when R_a was dominant and R_b/R_c was less important;
- ii) On-going studies on dry deposition velocities in a rice field in Thailand are using the Bowen method;
- iii) It is important when using the Inferential Method based on the Resistance Model to consider specific site conditions, particularly variables that control deposition velocity. The Inferential Method requires small adjustments for use in the temperate areas but substantial modification for use in the tropical areas.

Dr. HongYou-Deog

Dr. Hong made a presentation on "Dry Deposition Monitoring in Korea". He informed that:

- i) The 3-stage filter pack is used to monitor air concentrations in Republic of Korea;
- ii) Dry deposition is calculated and reported nationally at all the monitoring sites in Republic of Korea;
- iii) The monitoring data from 3 EANET sites in Republic of Korea which were affected by trans-boundary air pollutants was introduced;
- iv) It is recommended to develop QA/QC for meteorological measurements.

Dr. Hiromasa Ueda

Dr. Ueda made a presentation entitled "On Dry Deposition Estimation From Modeller's Point of View". He recommended that:

- i) Model inter-comparison should be carried out among developed models categorized in 0-3 module levels for gas and particle species;
- ii) It is important to carry out a study to validate the models with the field observations;
- iii) The use of satellite data such as LANDSAT, MODIS, AVHRR etc. should be considered.

VIII. Summary of presentations and discussions

The meeting discussed current researches on dry deposition and agreed to make the following recommendations to the Task Force on Dry Deposition Monitoring and SAC:

Recommendations:

1. Method for estimation of dry deposition flux for EANET

- i) To use the Inferential Method with the resistance parameters of Ra (Erisman & Draaijers, 1995), Rb (Erisman & Draaijers, 1995) and modified Rc (modified by Dr. Matsuda) for forests and grass, for both gases and particulate matter.
- ii) To estimate flux of all the priority gaseous species including ammonia and fine particulates.
- iii) To take into consideration the land use and seasonal conditions by dividing the region into sub-regions based on their seasonal conditions.
- iv) To collect land use and vegetation information using all available means including information from satellites such as LANDSAT, MODIS and AVHRR; map imaging information such as Google Earth.
- v) NC to inform countries to measure wind speed and precipitation amounts at EANET sites as a first step.
- vi) To measure the following meteorological parameters at selected sites:
 - Wind speed and direction
 - Solar radiation
 - Temperature and Relative humidity
 - Precipitation amount
- vii) NC to start collecting information on land use and vegetation in the region.

2. Preferred Monitoring Sites for Field Studies

The preferred sites shall have the following features:

Topography and Land Use

- i) Relatively flat land
- ii) Remote or rural site
- iii) Forest
- iv) Agricultural land
- v) Grassland

Climatology

- i) Tropical
- ii) Sub-tropical
- iii) Temperate
- iv) Boreal
- v) Arid

3. Reporting of dry deposition flux

- i) To report dry deposition fluxes annually in the EANET Data Report.
- ii) The NC to develop an appropriate data table to display the deposition velocities. To insert a statement to mention the method used to determine dry deposition and inform that dry deposition parameterization will be improved in the future.

4. Future research projects for improvement of estimation method for dry deposition

More research efforts are needed because of many uncertainties in estimation of dry deposition. The priority projects identified for improvement of estimation method for dry deposition are:

- i) Aerosol deposition study to forests by both direct and indirect methods
- ii) Ammonia deposition flux estimation by both direct and indirect methods

- iii) Flux estimation model inter-comparison
- iv) Flux estimation model inter-comparison with field observations

Members will make an effort to apply research funds on their existing sites/new regional scale projects.

5. Validation of the Inferential Method

To use the following direct measurements to validate the Inferential Method:

- i) Gradient method
- ii) Bowen method
- iii) Eddy correlation method

IX. Preparation of the Technical Manual on Dry Deposition Flux Estimation

The Secretariat presented the draft contents of the proposed Technical Manual on Dry Deposition Flux Estimation. The meeting adopted the revised Table of Contents and agreed on the lead authors of each chapter (see Annex 3). The Meeting also agreed that:

- i) The development of the Technical Manual should proceed while evaluation and field experiments are being conducted;
- ii) The Technical Manual shall be not more than 100 pages;
- iii) The 1st draft document of the Technical Manual should be ready for discussion at the 2nd meeting;
- iv) The deadline for submission of the first draft to the Secretariat shall be January 31, 2009.
- v) The NC shall send the format and guidelines for preparation of the text to all members by end of November.

X. Next Steps and Schedule

The Meeting adopted the revised Schedule of Activities. (see Annex 4)

The Meeting proposed to hold a second meeting in a day of February/March 2009 back to back with the international workshop organized by Dr. Matsuda and held at Meisei University in Tokyo. Once the date and venue are finalized, the Secretariat will send invitation letters to members. The Secretariat will also send invitations to the proposed resource persons (Dr. Erisman at Energy Research Center of the Netherlands and/or Dr. Meyers at NOAA). Dr. Matsuda and Dr. Hayashi will also contact them in advance.

The Secretariat will circulate the minutes of the meeting to all members within a month after the meeting. The Secretariat will compile the first draft of the Technical Manual on Dry Deposition Flux and circulate it to the members before the second meeting.

LIST OF PARTICIPANTS

Members of the Expert Group

Dr. Pojanie Khummongkol (Chair person)
Associate Professor
Environmental Technology Division,
School of Energy, Environment and Materials,
King Mongkut's University of Technology Thonburi,
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Network Center for EANET

Acid Deposition and Oxidant Rsearch Center
Japan

Ms. Leong Chow Peng
Deputy Director General

Mr. Akira Nitta
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Attachment 1

**FIRST MEETING OF THE
EXPERT GROUP ON DRY DEPOSITION FLUX ESTIMATION**

(Niigata, 23-24 June 2008)

Revised Draft Terms of Reference

1. To review existing researches of direct measurement and inferential method for estimation of dry deposition flux
2. To select monitoring sites where estimation by inferential method or direct method could be implemented
3. To evaluate the inferential method by using direct measurement results in and outside of EANET region
4. To prepare a Technical Manual for dry deposition flux estimation
5. To identify future research activities on dry deposition

Attachment 2

**FIRST MEETING OF THE
EXPERT GROUP ON DRY DEPOSITION FLUX ESTIMATION**

(Niigata, 23-24 June 2008)

List of Members

Dr. Pojanie Khummongkol (Chair person)
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Attachment 3

**FIRST MEETING OF THE
EXPERT GROUP ON DRY DEPOSITION FLUX ESTIMATION**

(Niigata, 23-24 June 2008)

Technical Manual on Dry Deposition Flux Estimation

Revised Draft Table of Contents and Lead Authors

1. Introduction [Dr. Pojanie]
 - 1.1. Background
 - 1.2. Objectives of dry deposition flux estimation
 - 1.3. Outline of the manual for dry deposition flux estimation

2. Fundamental items for dry deposition flux estimation
 - 2.1. Air quality measurements [Dr. Hong]
 - 2.1.1. Siting of air quality monitoring instruments
 - 2.1.2. Priority chemical species in EANET
 - 2.1.3. Instrumentation
 - 2.1.4. Sampling period
 - 2.2. Meteorological Measurements [Dr. Takahashi]
 - 2.2.1. Siting of meteorological instruments
 - 2.2.2. Meteorological parameters necessary for dry deposition flux estimation
 - 2.2.3. Instrumentation
 - 2.2.4. Monitoring period
 - 2.3. Land Use Information [Dr. Ueda (Network Center)]
 - 2.3.1. Land surface data
 - 2.3.2. Plant type data

3. Methodology for dry deposition flux estimation in EANET [Dr. Matsuda]
 - 3.1. Outline of the Inferential Method
 - 3.2. Parameterization of dry deposition velocity
 - 3.2.1. Gaseous species
 - 3.2.2. Particulate matter

- 3.3. Computation of dry deposition flux

4. Data reporting [Dr. Ueda (Network Center)]

5. Evaluation of dry deposition flux determined by the Inferential Method [Dr. Hayashi]
 - 5.1. Gaseous species
 - 5.2. Particulate matter

6. Direct measurement for determining dry deposition flux [Dr. Pojanie]
 - 6.1. Gradient Method
 - 6.2. Bowen Ratio Method
 - 6.3. Eddy Correlation Method
 - 6.4. Eddy Accumulation Method
 - 6.5. Surrogate Surface Method
 - 6.6. Throughfall Method

7. Use of remotely sensed information [Dr. Ueda]

8. Future direction of dry deposition flux estimation [Dr. Matsuda]

Attachment 4

**FIRST MEETING OF THE
EXPERT GROUP ON DRY DEPOSITION FLUX ESTIMATION**

(Niigata, 23-24 June 2008)

Revised Schedule of Activities

2008												2009												2010											
5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12				
Appointment of the members of the Expert Group																																			
The first meeting of the Expert Group (23-24 June 2007)																																			
Review of current researches on dry deposition																																			
Submit minutes of the 1st meeting to the EG members and the Task Force on Dry Deposition Monitoring																																			
Report activity of the Expert Group at SAC8																																			
Validation of inferential method																																			
Preparation of the draft of the Technical Manual																																			
												Submission deadline for the 1st draft of the Technical manual																							
												The second meeting of the Expert Group (Back to back the International Workshop at Waisei University) Discussion about the 1st draft of the Technical Manual																							
												Submit minutes of the 2nd meeting to the EG members and the Task Force on Dry Deposition Monitoring																							
												Submission of the draft Technical Manual to the Task force on Dry Deposition Monitoring for getting some feedback																							
												Report activity of the Expert Group and present the draft Technical Manual at SAC9 for comments																							
																								The third meeting of the Expert Group to finalize the Technical Manual (TBD)											
Development of new research activities of dry deposition flux estimation and review research projects																								Submission of the final draft at SAC10 for adoption											

Concept Paper of High Priority Research Projects

Title of Project	Aerosol deposition studies in forests for improvement of estimation method for dry deposition														
Purpose/Objectives	Application of direct measurement method to determine aerosol deposition flux and velocity in forest canopy in the tropical region.														
Background Information	Scientific information on the aerosol deposition flux in the tropical region are non existent while substantial data for the northern hemisphere are available in publications. This study will supplement the EANET countries in the tropical regions to be able to estimate the aerosol depositions and hence, the total depositions which include both the wet and dry depositions can be determined.														
Scope/Activities	<ol style="list-style-type: none"> 1. Direct measurement of aerosol deposition flux will be conducted in the forest in Thailand, 2. Principal aerosols to be study consist of SO_4^- and NO_3^- 3. Seasonal effects on the acid deposition will be determined, 4. Seasonal differences in the tropical region will be compared with the available inferential model applied for the sub-temperate region. 														
Cost Estimate	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2"><u>Total 30,000.00 USD</u></td> </tr> <tr> <td>Personnel cost</td> <td style="text-align: right;">8,000</td> </tr> <tr> <td>Travel cost</td> <td style="text-align: right;">1,000</td> </tr> <tr> <td>Equipment</td> <td style="text-align: right;">10,000</td> </tr> <tr> <td>Consumables</td> <td style="text-align: right;">11,000</td> </tr> <tr> <td></td> <td style="text-align: right;">-----</td> </tr> <tr> <td style="text-align: right;">Total</td> <td style="text-align: right;">\$30,000</td> </tr> </table>	<u>Total 30,000.00 USD</u>		Personnel cost	8,000	Travel cost	1,000	Equipment	10,000	Consumables	11,000		-----	Total	\$30,000
<u>Total 30,000.00 USD</u>															
Personnel cost	8,000														
Travel cost	1,000														
Equipment	10,000														
Consumables	11,000														

Total	\$30,000														
Timeframe/Schedule	2009														
Output	<ol style="list-style-type: none"> 1. Values of aerosol deposition flux in the tropical region 2. Improvement of the estimation method using the outcome of this study to relate with the inferential method for the flux estimation 														
Proposed Funding Source	EANET budget														