

The ninth Session of the Scientific Advisory Committee
on the Acid Deposition Monitoring Network in East Asia
14-16 October 2009, Tsukuba, Japan

Progress report on the activities of the Expert Group on Revision of Technical Manual on Wet Deposition Monitoring

Chair of the Expert Group

I. Background

1. The Ninth Session of the Intergovernmental Meeting (IG9) held on 19-20 November 2007 in Vientiane, Lao PDR approved the establishment of the Expert Group on Revision of Technical Manual on Wet Deposition Monitoring together with other Task Forces and Expert Groups based on the recommendation of the Seventh Session of the Scientific Advisory Committee (SAC7). The task forces and expert groups have enabled more effective implementation of the scientific activities of the Strategy on EANET Development (2006-2010) in collaboration with the Network Center (NC) and the Secretariat of the Acid Deposition Monitoring Network in East Asia (EANET).
2. SAC7 appointed Prof. Hiroshi Hara as the Chairperson of the Expert Group on Revision of Technical Manual on Wet Deposition Monitoring and the NC for EANET as the secretariat.
3. The first meeting of the Expert Group was held at the Acid Deposition and Oxidant Research Center (ADORC), Niigata, Japan on 2 - 3 October 2008.

II. Activities

II-1. Approved Terms of Reference (TOR) of the Expert Group

4. At the Tenth Session of Intergovernmental Meeting (IG10) held in November 2008, the TOR was approved as the following contents:
 - To identify the technical and administrative problems associated with wet deposition monitoring encountered in the EANET operation since the beginning of the preparatory-phase operation
 - To evaluate differences in the measurement techniques of other regional monitoring programs and modify the current EANET procedures if necessary for comparability of the measurements
 - To discuss advances in the measurement techniques in long-term monitoring and intensive studies, and modify such techniques in an appropriate manner for the EANET Technical

Manual

- To produce a revised Technical Manual on Wet Deposition Monitoring

II-2. Members

5. The members of the Expert Group are as follows:

Prof. Hiroshi Hara (Chairperson)	Tokyo University of Agriculture and Technology, Japan
Mr. Izumi Noguchi	Hokkaido Institute of Environmental Sciences, Japan
Dr. Tsuyoshi Ohizumi	Environmental Management Division, Department of Civic and Environmental Affairs, Niigata Prefectural Government, Japan
Ms. Bulgan Tumendemberel	Office of National Security Council, Mongolia
Dr. Joon Young Ahn	National Institute of Environmental Research, Republic of Korea
Dr. Hathairatana Garivait	Environmental Research and Training Center, Thailand
Dr. Dave Mactavish	Science and Technology Branch, Environment Canada
Ms. Leong Chow Peng	Malaysia
Mr. Shinji Nakayama	ADORC

II-3. Major discussions at the first meeting of the Expert Group

6. The major discussions of the first meeting for revision of the technical manual are summarized as follows:

- The revised manual should, as far as possible, harmonize with procedures in the WMO Manual for the GAW Precipitation Chemistry Programme and EMEP manual for sampling and analysis.
- The recommended procedures for siting of sites should apply to the other monitoring activities of EANET.
- The revised Technical Manual shall contain more precise information regarding snow sampling as requested by the Task Force on Monitoring Instrumentation.
- The revised Technical Manual shall include a list of useful websites in the Appendix.
- In view of the importance of meteorological data for assessment of acid deposition, the meeting agreed that the revised Technical Manual shall further stress the importance of the measurements, the need to follow the WMO siting criteria for the meteorological instruments and the importance of regular calibration.
- The current Data Quality Objectives (DQOs) for EANET could be further improved and

decided to follow the format of the WMO Data Quality Objectives for Global Atmospheric Watch Programme (GAW).

- The importance of preparation of SOPs for all elements of operation by the national monitoring centers should be stressed. The NC was requested to compile the SOPs of all countries and make them available to all countries.
 - It was decided to include additional items on determination of HCO_3 , fluoride, nitrite, phosphate and organic acids in the analytical methods, new QA/QC items namely data validation, inter-laboratory comparison program and meta data, and include an appendix with suggestions for improvement based on the inter-laboratory comparison results and a list of suppliers and manufacturers.
7. A draft Table of Contents (revised) was prepared as the guide for the revision of the contents of the manual. Lead authors and Members to revise each chapter were assigned by the Chairperson.
8. It was concluded that more research activities are needed to identify ways to improve wet deposition monitoring. The research results will be useful for formulating better procedures for analysis or modification of the present criteria for ion balance. Some of the research projects proposed are:
- i) HCO_3 Index experiment
 - ii) An intercomparison project for field operations (reference method)
 - iii) Organic acids

II-4. The second meeting of the Expert Group

9. The second meeting of the Expert Group was held at ADORC, Niigata, Japan on 1 - 2 October 2009. The minutes of the meeting are attached as Annex.
10. The main discussions of the second meeting are summarized as follows:
- Contribution to acidification of rain water by organic acid and analytical methods to measure organic acids in rainwater were included in the content. Since energy situation in Asia is changing, organic compounds and organic acids will play an important role in the wet deposition. Developed analytical method and sample treatment and preservation of organic acids should be described.
 - There was the difference in required criteria for R1 between EANET manual and WMO manual. EANET manual has set more strict criteria for R1 than WMO manual, data quality has been improving year by year and most of the data sets are high quality. Since the current criteria are sufficient for current analytical capability of EANET, it was decided to be kept the

current criteria, as it was.

- There were differences in DQOs completeness between EANET manual and WMO manual. In WMO manual, %PCL was higher and %TP was lower than EANET manual. Since there is currently no serious problem in the criteria, the criteria was decided to be kept as it was.
- EMEP flag system can describe a lot of meanings with only single code. It was proposed to modify the flag system and data reporting form harmonizing with procedures in EMEP manual.
- It was proposed to identify the problems of outliers for inter-laboratory comparison program, and the revised description to improve QA/QC be added in the technical manual.
- There are some grades of water quality in analytical procedure. It is necessary to define again the quality class of water we ordinarily use.

II-5. Schedule

11. The schedule of the activities of the Expert Group was also discussed at the first and the second meeting. The Expert Group agreed on the following schedule:

<u>2-3 October 2008</u>	<i>First meeting of the Expert Group to identify problems and find solutions</i>
<u>15-17 October 2008</u>	<i>Chair of EG reports to SAC8</i>
<u>October to December 2008</u>	<i>Comments from SAC and IG (if any) will be informed to the members by the NC (secretariat)</i> <i>Preparation of the document draft by EG members</i> <i>Compilation of the first draft of the revised Technical Manual on Wet Deposition Monitoring by NC (secretariat) and Chair</i>
<u>31 December 2008</u>	<i>Deadline for draft submission to NC</i>
<u>January to March 2009</u>	<i>Circulation of the first draft to members</i> <i>Review of the first draft of the revised Technical Manual</i>
<u>March to August 2009</u>	<i>Revision of the draft revised Technical Manual</i>
<u>31 August 2009</u>	<i>Deadline for second draft submission to NC,</i> <i>Circulation of the second draft to members</i>
<u>1-2 October 2009</u>	<i>Second meeting of the expert group to finalize the draft revised Technical Manual</i>
<u>14-16 October 2009</u>	Submission of the draft revised Technical Manual by the Chairperson to SAC9 for comments
<u>Autumn 2010</u>	Submission of the final draft of the revised Technical Manual by the Chairperson to SAC10 for adoption

ACID DEPOSITION MONITORING NETWORK IN EAST ASIA (EANET)

SECOND MEETING OF THE EXPERT GROUP ON REVISION OF TECHNICAL MANUAL ON WET DEPOSITION MONITORING SCIENTIFIC ADVISORY COMMITTEE (SAC) OF EANET

(Niigata, 1-2 October 2009)

PROVISIONAL AGENDA

October 1

09:00-09:15

1. Welcome remarks

Dr.Akimoto

09:15-09:30

2. Introductory remarks

Chairperson

09:30-10:00

3. Report of Progress since the first meeting of the Expert Group on Revision of the Technical Manual on Wet Deposition Monitoring including SAC8 and IG10 decisions

Chairperson and NC

10:00-10:30 Coffee Break

10:30-12:00

4. Consideration of the first draft revised Technical Manual

Contributors of the respective chapters

12:00-14:00 Lunch

14:00-16:00

5. Consideration of the first draft revised Technical Manual
(Continue)

Contributors of the respective chapters

16:00-16:30 Coffee Break

16:30-18:00

6. Consideration of the first draft revised Technical Manual
(Continue)

Contributors of the respective chapters

18:00 Departure to hotel

October 2

09:00-10:00

7. Finalization of the draft revised Technical Manual for submission to the SAC9

Discussion

10:00-10:30 Coffee Break

10:30-12:00

8. Finalization of the draft revised Technical Manual
for submission to the SAC9
(Continue)

Discussion

12:00-14:00 Lunch

14:00-15:00

9. Next steps and schedule

Discussion

15:00 Close

MEETING MINUTES

I. Agenda

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

II. Welcome Remarks

Dr. Akimoto, the Director General of the Acid Deposition and Oxidant Research Center (ADORC), welcomed members of the Expert Group on Revision of Technical Manual on Wet Deposition Monitoring (EGWDM) of the EANET Scientific Advisory Committee (SAC) to ADORC, Niigata, Japan. (See attached List of Participants.)

III. Introduction

The goal of the second meeting of the EGWDM are to prepare the revised draft of the issues including advances in wet deposition research and monitoring techniques harmonizing with WMO QA/QC programs by reviewing experiences during the operation and current manuals of global and regional networks.

IV. Consideration of the first draft revised Technical Manual

The meeting discussed the reviews and modifications required to update the contents of the Technical Manual for Wet Deposition Monitoring of EANET. The revised manual should, as far as possible, harmonize with procedures in the WMO Manual for the Global Atmospheric Watch (GAW) Precipitation Chemistry Program and EMEP manual for sampling and analysis. Major points of the discussion were:

- i) Contents of 6.10 on Organic acids determination method
Contribution to acidification of rain water by organic acid and analytical methods to measure organic acids in rainwater were included in the content. Since energy situation in Asia is changing, organic compounds and organic acids will play an important role in wet deposition. Developed analytical method and sample treatment and preservation of organic acids should be described.
- ii) Quality Assurance/Quality Control (QA/QC) Program of EANET
The following items were proposed:

- Data quality objectives (DQOs) should be added to 9.2 in QA/QC manual and removed from QA/QC program;
 - Since there were some differences on calculation method of bicarbonate concentration between EANET manual and EMEP manual, we should modify it;
 - Contents of 7.4 on Data validation in QA/QC manual should be removed because its substance was similar to 7.2 Data checking in the same manual; and
 - Siting criteria should be described in contents of 7.6 Meta data in QA/QC manual.
- iii) Chairperson reminded the members that following 2 items which was proposed by Dr. Dave in the first meeting of this expert group should be included in the revised manual:
- Inter-comparison with field operation by sharing common sampler should be mentioned in the revised manual.
 - Cloud depositions should be mentioned in Appendix in the revised technical manual.
- iv) Criteria for R1
- There was difference on the required criteria for R1 between EANET manual and WMO manual. EANET manual has set more strict criteria for R1 than WMO manual, data quality has been improving year by year and most of the data sets are high quality. Since the current criteria are sufficient for current analytical capability of EANET, it was decided to keep the current criteria, as it was.
- v) Criteria for Data Completeness
- There were differences in DQOs completeness between EANET manual and WMO manual. In WMO manual, %PCL was higher and %TP was lower than EANET manual. Since there is currently no serious problem in the criteria, the criteria was decided to be kept as it was. In northern region like Mongolia and Russia, %PCL in winter season is low because of very low precipitation. We should develop proper method for snow sampling and winter season sampling.
- vi) Flag System
- EANET flag system is different from EMEP flag system. EMEP flag system can describe a lot of meanings with only single code. It was proposed to modify flag system and data reporting form harmonizing with procedures in EMEP manual.
- vii) QA/QC
- It was proposed to identify the problems of outliers for inter-laboratory comparison program, and the revised description to improve QA/QC be added in the technical manual.
- viii) Definition of Waters
- There are some grades of water quality in analytical procedure. It is necessary to define again the quality class of water we ordinarily use.
- ix) Additional items
- The analysis of Mercury and its instrumental method were removed.
 - Problem with contamination of the apparatus, materials and reagents used for measurement and analysis was raised. Admitted contamination level should be described in detail in the revised technical manual.
 - It was decided to keep samples under refrigeration at less than 6°C, which is described in the revised technical manual.
 - Holding time of samples was recommended seven days. To clarify appropriate holding time as EANET, we need some research taking in consideration of variety of our laboratory conditions.

V. Modifications Required in the Current EANET Procedures (if necessary) for the Comparability of the Measurements

The Chairperson submitted preliminary drafts of table of contents of Technical Manual for Wet Deposition Monitoring in East Asia to the meeting. The meeting discussed and modified them, and agreed with the Draft Table of Contents attached as Annex 3.

VI. Identification of Lead Authors and Tasks

Lead authors and Members to revise every chapter were discussed and assigned. They were also shown in the Draft Table of Contents attached as Annex 3.

VII. Next Steps and Schedule

The Meeting discussed the next steps and schedule and adopted the Revised Schedule of Activities attached as Annex 4.

The Secretariat will circulate the minutes of the meeting to all members as soon as possible. The Chairperson will report the outcomes of the meeting at the SAC9 to be held on 14-16 October 2009 in Tsukuba, Japan.

LIST OF PARTICIPANTS

Members of the Expert Group

Prof. Hiroshi Hara (Chairperson)
Tokyo University of Agriculture and Technology
Japan

Mr. Izumi Noguchi
Hokkaido Institute of Environmental Sciences
Japan

Ms. Bulgan Tumendemberel
Office of National Security Council
Mongolia

Dr. Joon Young Ahn
National Institute of Environmental Research
Republic of Korea

Dr. Hathairatana Garivait
Environmental Research and Training Center
Thailand

Mr. Shinji Nakayama
Head, Data Management Department

Secretariat of the Expert Group

Dr. Hiroaki Yago
Head, Atmospheric Research Department

Mr. Tomokazu Nagai
Researcher, Atmospheric Research Department

Mr. Kenichi Koide
Researcher, Atmospheric Research Department

Network Center for EANET
Acid Deposition and Oxidant Research Center

Dr. Hajime Akimoto
Director General

Dr. Jesada Luangjame
Deputy Director General

Mr. Takaaki Ito
Deputy Director General

Mr. Jiro Sato
Assistant Deputy Director General

**Terms of Reference of the Expert Group
on Revision of Technical Manual
on Wet Deposition Monitoring**

1. To identify the technical and administrative problems associated with wet deposition monitoring encountered in the EANET operation since the beginning of the preparatory-phase operation
2. To evaluate differences in the measurement techniques of other regional monitoring programs and modify the current EANET procedures if necessary for comparability of the measurements
3. To discuss advances in the measurement techniques in long-term monitoring and intensive studies, and modify such techniques in an appropriate manner for the EANET Technical Manual
4. To produce a revised Technical Manual on Wet Deposition Monitoring

Annex 2

List of Members of the Expert Group

Chairperson	Prof. Hiroshi Hara	Tokyo University of Agriculture and Technology, Japan
Member	Mr. Izumi Noguchi	Hokkaido Institute of Environmental Sciences, Japan
	Dr. Tsuyoshi Ohizumi	Environmental Management Division, Department of Civic and Environmental Affairs, Niigata Prefectural Government, Japan
	Ms. Bulgan Tumendemberel	Office of National Security Council, Mongolia
	Dr. Joon Young Ahn	National Institute of Environmental Research, Republic of Korea
	Dr. Hathairatana Garivait	Environmental Research and Training Center, Thailand
	Dr. Dave MacTavish	Manager of the Canadian Air and Precipitation Monitoring Network (CAPMoN) Science and Technology Branch, Environment Canada Meteorological Service of Canada
	Ms. Leong Chow Peng	Malaysia
	Mr. Shinji Nakayama	Acid Deposition and Oxidant Research Center (ADORC)
Secretariat:	Dr. Hiroaki Yago	NC
	Mr. Tomokazu Nagai	NC
	Mr. Kenichi Koide	NC

Technical Manual on Wet Deposition Monitoring Draft Table of Contents (tentatively revised)

1. **Introduction (Philosophy)** (*Prof. Hiroshi Hara, Dr. Dave Mactavish*)
 - 1.1 Background
 - 1.2 Objectives of wet deposition monitoring
 - 1.3 Outline of the manual for monitoring wet deposition
2. **Siting** (*Prof. Hiroshi Hara, Mr. Izumi Noguchi*)
 - 2.1 Monitoring sites
 - Clarify difference between urban, rural and remote sites (ref WMO)**
 - 2.1.1 Siting the sampling equipment
 - 2.1.2 Minimum distance to emission and contamination sources
 - 2.1.3 Local criteria
 - 2.1.4 Site relocation (to be added)**
 - 2.2 Monitoring frequency and measurement parameters
 - 2.2.1 Monitoring frequency
 - 2.2.2 Measurement parameter
 - Review monitoring frequency – weekly measurements, common sampling day**
3. **Sampling** (*Dr. Tsuyoshi Ohizumi, Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel*)
 - 3.1 Introduction
 - 3.2 Precipitation sampling
 - 3.2.1 Facilities at the site
 - 3.2.2 Sample collection instruments
 - 3.3 Snow sampling
 - Review techniques for snow sampling**
4. **Site Operation** (*Mr. Izumi Noguchi, Dr. Tsuyoshi Ohizumi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait, Prof. Hiroshi Hara*)
 - 4.1 Collection of samples
 - 4.1.1 Measurement of precipitation amount
 - 4.1.2 **Sample Preservation**
 - Refrigeration**, Use of biocides
 - Review use of biocides** (*Prof. Hiroshi Hara, Dr. Tsuyoshi Ohizumi,*)
5. **Sample Handling** (*Mr. Izumi Noguchi, Dr. Tsuyoshi Ohizumi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
 - 5.1 Introduction
 - 5.2 Cleaning and preparation of collection vessel
 - 5.3 Transport of the collection vessel to the collector
 - 5.4 Removal and replacement of sample at the collector
 - 5.5 Transportation of sample to the sample handling area
 - 5.6 On-site measurements
 - 5.7 Field blank
 - 5.8 On-site sample preservation
 - 5.9 Sample documentation
 - 5.10 Routine instrument checking and maintenance
 - 5.11 Sample shipment

6. Chemical Analysis (*Mr. Izumi Noguchi, Prof. Hiroshi Hara, Dr. Hathairatana Garivait, Ms. Bulgan Tumendemberel, Dr. Joon Young Ahn*)
 - 6.1 Introduction
 - Para 2 should be modified for HCO₃, fluoride, nitrite and organic ions
 - Laboratory treatment of samples (*Dr. Hathairatana Garivait*)
 - 6.2 Quality of chemicals and water (*Dr. Hathairatana Garivait*)
 - 6.3 Electric conductivity (*Mr. Izumi Noguchi*)
 - 6.3.1 Background
 - 6.3.2 Apparatus
 - 6.3.3 Reagent solution
 - 6.3.4 Calibration (specification of procedure)
 - 6.3.5 Measurement procedure
 - 6.4 pH measurement (*Mr. Izumi Noguchi*)
 - 6.4.1 Background
 - 6.4.2 Apparatus
 - 6.4.3 Reagents and solutions
 - 6.4.4 Calibration of pH meter
 - 6.4.5 Measurement procedure
 - 6.5 Anion determination by ion chromatography (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
 - 6.5.1 Background
 - 6.5.2 Apparatus
 - 6.5.3 Reagents and solutions
 - 6.5.4 Measurement procedure
 - 6.6 HCO₃ determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
 - 6.6.1 Background
 - 6.6.2 Apparatus
 - 6.6.3 Reagents and solutions
 - 6.6.4 Measurement procedure
 - 6.7 Fluoride determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
 - 6.7.1 Background
 - 6.7.2 Apparatus
 - 6.7.3 Reagents and solutions
 - 6.7.4 Measurement procedure
 - 6.8 Nitrite determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
 - 6.8.1 Background
 - 6.8.2 Apparatus
 - 6.8.3 Reagents and solutions
 - 6.8.4 Measurement procedure
 - 6.9 Phosphate determination method (*Mr. Izumi Noguchi, Ms. Bulgan Tumendemberel, Dr. Hathairatana Garivait*)
 - 6.9.1 Background
 - 6.9.2 Apparatus
 - 6.9.3 Reagents and solutions
 - 6.9.4 Measurement procedure
 - 6.10 Organic acids determination method (*Dr. Joon Young Ahn, Dr. Hathairatana Garivait*)
 - 6.10.1 Background
 - 6.10.2 Apparatus
 - 6.10.3 Reagents and solutions
 - 6.10.4 Measurement procedure
 - 6.11 Cation determination by ion chromatography (*Dr. Joon Young Ahn*)
 - 6.11.1 Background

- 6.11.2 Apparatus
- 6.11.3 Reagents and solutions
- 6.11.4 Measurement procedure
- 6.12 Ammonium ion determination by spectrophotometry (*Dr. Joon Young Ahn*)
 - 6.12.1 Background
 - 6.12.2 Apparatus
 - 6.12.3 Reagents and solutions
 - 6.12.4 Measurement procedure
- 6.13 Metal determination by atomic absorption/emission spectrometry (*Dr. Joon Young Ahn*)
 - 6.13.1 Background
 - 6.13.2 Apparatus
 - 6.13.3 Calibration
 - 6.13.4 Procedure

7. QA/QC (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)

- 7.1 Classification of data
 - 7.1.1 Reporting data
 - 7.1.2 Controlled data by individual country
- 7.2 Data checking
 - 7.2.1 Statistical test
 - 7.2.2 Ion balance and conductivity balance check
 - 7.2.3 Data completeness
 - 7.2.4 Analytical precision
- 7.3 Data flags

7.4 Data Validation

7.5 Inter-laboratory Comparison Program

7.6 Meta Data

8. Data Reporting (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)

- 8.1 Data reporting form
 - 8.1.1 Information about sites, sampling, shipping, laboratory operation
 - 8.1.2 Chemical analysis
 - 8.1.3 Measurement results and flags

9. **Overall QA/QC** (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)

- 9.1 Introduction
- 9.2 Data quality assessment
 - 9.2.1 Sampling precision
 - 9.2.2 Quality control of laboratory measurements
Table 11.12 acceptable levels should be reviewed, too tight?
- 9.3 Site performance audit
- 9.4 Preliminary quality assurance of obtained data sets
- 9.5 External quality assurance program
- 9.6 Training

Appendix

Improvement according to the Interlab comparison results (*Mr. Shinji Nakayama, Prof. Hiroshi Hara*)

List of suppliers and manufacturers (NC)

List of useful web sites (NC)

- Items underlined shows new items or contents to be reviewed and Furthermore, the item expressed with the bold letter shows more important items.
- Names underlined are the lead authors of each chapter.

Annex 4

FUTURE SCHEDULE

1-2 October 2009	Second meeting of the expert group to finalize the draft revised Technical Manual
14-16 October 2009	Submission of the draft revised Technical Manual by the Chair to SAC9 for comments
October to December 2009	Comments from SAC and IG (if any) will be informed to the members by the NC (secretariat)
Autumn 2010	Submission of the final draft of the revised Technical Manual by the Chair to SAC10 for adoption
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