

Progress report on the activities of the Task Force on Monitoring for Dry Deposition (TFMDD)

SAC21

26-28 October 2021

Virtual Meeting

Chair and Secretariat of the Task Force

TOR and member of the Task Force on MDD

(TOR)

- i) To further develop and elaborate the strategy for dry deposition evaluation in the region
- ii) To discuss on future direction of dry deposition evaluation and provide guidance on relevant activities based on the strategy
- iii) To improve the Technical Manuals for Air Concentration Monitoring and Dry Deposition Flux Estimation
→ 2nd meeting of the Expert Group on revision of the Technical Manuals (EGRTM) was held on May 2021 (EANET/SAC 21/15/1 Annex1-3).

(Member)

Besides the Chair, one member from each EANET participating country has been nominated as the TFMDD member.

The member list is shown in Page 3 of EANET/SAC 21/15/1.

Strategy Paper on Future Direction of Monitoring for Dry Deposition of EANET (2021-2026)

- The Strategy Paper was drafted by the NC and the contents were discussed by the TFMDD5 meeting in July 2020.
The final draft of the Strategy Paper was adopted by SAC20 in September 2020.
- The Strategy Paper will serve as a guide for the Task Force and other related groups for planning and implementing future activities for more elaborated atmospheric monitoring and atmospheric deposition data including dry deposition flux for the assessment of the adverse effects.
- **The Strategy Paper includes 6 activities to be implemented** to achieve the objectives of the Strategy on Monitoring for Dry Deposition from 2021 to 2025.

Activities to be implemented from 2021 to 2025

Activity	2021	2022	2023	2024	2025
i-i) Review of the Technical Manual for Air Concentration Monitoring in East Asia	X	X			
i-ii) Consideration on feasibility of developed monitoring techniques	X	X	X	X	X
ii) Further develop and elaborate dry deposition flux estimation methodology	X	X			
iii) Enhancement of spatial coverage for dry deposition flux estimation	X	X	X	X	X
iv) Promotion of an ozone monitoring network for the review of its current status in East Asia	X	X	X	X	X
v) Promotion of a PM ₁₀ /PM _{2.5} monitoring network for the review of their current status in East Asia	X	X	X	X	X
vi) Further elaborate QA/QC for air concentration monitoring	X	X	X	X	X

Activities i-i) and ii) are related to the revisions of the Technical Manuals.

Results of the 2nd meeting of EGRTM (EGRTM2)

EGRTM2 was held at the virtual meeting on 11 May 2021. The minutes of EGRTM2 is attached as **Annex 1** and the 2nd draft of revised Technical Manuals are attached as **Annexes 2 and 3**.

(Major discussions at EGRTM2)

- It was clarified that that the monitoring data of NO is submitted to EANET from some participating countries and NO is included in the EANET monitoring Guideline too.
- One suggestion from EG about the section of denuder method is that the denuder can be introduced as one device connected to filter pack to avoid the artifact.
- The EG suggested that the DQO and data completeness should be shown for automatic methods and manual methods respectively.
- It was suggested that the methodology calculating the dry deposition flux of the fine and coarse particulate matter will be added in annex.
- It was suggested that the inferential method will be applied estimating the dry deposition flux, because of the feasibility and usability. The advanced methodologies using weather forecast model or resistance model will be described in appendix.

Draft contents of the revised TMACM (1)

[The contents are followed by the current version.]

(Chapter 1 Introduction)

The revision of the Guidelines for Acid Deposition Monitoring in East Asia will be linked with the revised Technical Manuals.

1.1. Background

- Historical background of air concentration monitoring documents
- Establishment of the expert group

1.2. Objectives

- To provide guideline of air concentration monitoring and to standardize air concentration monitoring methodology

The classification of priority is deleted.

1.3. Priority chemical species in EANET

First priority: SO_2 , O_3 , NO , NO_2 (urban), HNO_3 , HCl , NH_3 , Particulate component (SO_4^{2-} , NO_3^- , Cl^- , NH_4^+ , Na^+ , Mg^{2+} , K^+ and Ca^{2+}), PM_{10}

Second priority: NO_2 (rural and remote), $\text{PM}_{2.5}$

1.4. Outline of the manual

- Relationship between the species and the corresponding monitoring methods was described.

Chemical composition measurement of PM_{10} and $\text{PM}_{2.5}$ will be described in the future direction.

Draft contents of the revised TMACM (2)

[The contents are followed by the current version.]

(Chapter 2 Monitoring design)

The description about site criteria in has been simplified and referred the Monitoring Guideline of EANET.

2.1. Siting criteria

- To be consistent with EANET Guideline.
- To consider regional representativeness.
- Refer to the other networks such as WMO/GAW, EMEP CASTNET.

2.2. Site facilities and Instrumentation (Electricity, Housing, Air conditioning, Inlet, Data communication, monitor arrangement etc.)

- Sampling inlet should be considered to avoid local interference and should refer other international networks.
- To consider humid condition in Southeast Asian region.
- Description of sampling tube is added.

2.3. Monitoring frequency

- Hourly: Automatic monitors and meteorological instruments.
- Weekly or Bi-weekly: Manual monitoring.

Draft contents of the revised TMACM (3)

[The contents are followed by the current version.]

(Chapter 3 Automatic monitoring)

Manuscript structure was reorganized and minor information will be deleted or moved to appendix.

3.1. Point measurement

- For each instrument, the monitoring principle should be described at first, and then calibration procedure should be described in the following section.
- SO₂: UV (200-240nm) absorption and emission of photons occurs. (300-400nm)
- NO_x: Chemiluminescence detection, detecting not only NO and NO₂.
- O₃: UV (254nm) absorption.
- The principle of monitoring apparatus for PM (β -ray and TEOM) described in details.

3.2. DOAS measurement

- The advantage and disadvantage about DOAS were summarized.

3.3. Meteorology

- Instruments necessary for dry deposition flux estimation and local meteorology was described.

In introduction the brief explanation of the historical measurement method and newly advanced method (CAPS, LIF for NO₂ monitoring, Low-cost sensor system for gas and PM_{2.5} monitoring) are described.

Draft contents of the revised TMACM (4)

[The contents are followed by the current version.]

(Chapter 4 Manual monitoring)

4.1. Filter pack

- To summarize advantage and disadvantage.
- Monitoring of sulfur species and total nitrogen is reliable, but there is artifacts of gaseous and particulate nitrogen compounds.
- Uncertainty of monitoring will be described with reference to previous studies.
- Factors causing errors will be described. (leak check, skillfulness, etc.)

4.2. Annular denuder

- Can avoid artifact artifacts of gaseous and particulate matters.
- High cost compared to filterpack and passive sampler.
- Require skillfulness of laboratory operator.

4.3. Passive sampler

- Low cost method compared to automatic monitors
- May be affected by severe meteorological conditions.
- Intercomparison with automatic instrument is recommended.

The filter pack or other manual sampling are suitable in the place where PM concentration is too low to measure the concentration using the automatic monitors. This is described in the introduction

The section of denuder method has been moved after passive sampler.

Draft contents of the revised TMACM (5)

[The contents are followed by the current version.]

(Chapter 5 Maintenance)

5.1. Standard operating procedures

- Objective and concept of SRP will be described as introduction.
- Example of SRP will be attached in Appendix.

5.2 Maintenance of manual samplers and analytical instruments

Schedule of maintenance (Items and intervals)

5.3. Maintenance of automatic monitors

- Schedule of maintenance (Items and intervals)
- Lifespan of automatic monitors

5.4. Field record

- Record sheet will be kept in station or laboratory.

5.5 Maintenance record

- Example of field record was given.

5.6. Safety management

- Management of gas cylinders and disposal of hazardous wastes

The examples of field record and maintenance record has been added.

Draft contents of the revised TMACM (6)

[The contents are followed by the current version.]

(Chapter 6 Data reporting and validation)

Will be revises according to the current data report format.

6.1. Site specification

- Information of effects on air concentrations.
- Information on the precision of monitoring results.

6.2. Compilation of raw monitoring data

- Specify time resolution of air concentration monitoring.
- Level of monitoring data were specified. (Raw data, Calculated data, etc.)

6.3. Data validation

- Data completeness should be 75% for automatic and 70% of manual.

6.4. Submission of finalized data

- Three kinds of data form including filter pack, automatic and meteorological parameter were to be prepared.

6.5. Data storage

- Principally, raw data (chart and electronic) should be store for 3 years.
- NC will establish data server and provide upon request.

Draft contents of the revised TMACM (7)

[The contents are followed by the current version.]

(Chapter 7 Quality Control and Quality Assurance)

- 7.1. Fundamental matters
- 7.2. Data Quality Objectives (DQOs)
 - Definition of detection/reporting limits was described.
- 7.3. Monitoring site (Site audit)
- 7.4. Field and laboratory operations
- 7.5. Data management
 - Routine data check, exclusion of outlier data
- 7.6. Determination of accuracy and detection limit
 - Noise level, precision check, parallel monitoring, etc.
- 7.7. QA/QC implemented by NC
- 7.8. Training programs

At the beginning part, the goal of DQO and data completeness will be clearly described..

The detection limits for daily sampling and weekly sampling are separately described.

(Chapter 8 Conclusions)

- The content covers how to use this manual, future issues on PM_{2.5} monitoring, and so on.
- How to use and combine the national manuals and EANET manuals was also described.

Draft contents of the revised TMDDFE (1)

[The contents are followed by the current version.]

(Chapter 1 Introduction)

Try to avoid duplication of TMACM

1.1. Background

→ Several methods of dry deposition flux estimation discussing pros and cons of each method is introduced. **These include model simulation, simplified parameterization of deposition velocity**

1.2. Objectives of dry deposition flux estimation

→ Description of suitable monitoring site and ultimate object such as investigating a long term adverse effect should be added.

1.3. Outline of the manual for dry deposition flux estimation

Daily, weekly, monthly ave. will be considered in future

(Chapter 2 Fundamental items for dry deposition flux estimation)

2.1. Air quality measurements (Hourly)

→ Siting, Priority chemical species, Instrumentation, Sampling period
→ All the measurement parameters excluding PM should be calculated for dry deposition flux estimation.

2.2. Meteorological measurements (Hourly)

→ Siting, Meteorological parameters, Instrumentation, Sampling period
(Minimum parameters: Wind speed, Wind direction, Temperature, Relative humidity, Solar radiation and Precipitation amount)

Draft contents of the revised TMDDFE (2)

[The contents are followed by the current version.]

(Chapter 2 Fundamental items for dry deposition flux estimation, continued)

2.3. Land use information

Try to avoid duplication of TMACM

- Soil type, Forest fraction, Soil temperature, Land waters mask, Vegetation type etc.
- The site information reported by the national monitoring plan of each country will be primarily used. If domestic land use data is available in each country, the data can be used. Otherwise, the global land cover characteristic data from the USGS Web site is also useful.

(Chapter 3 Data reporting)

- Description of Chapter 3 should be modified in accordance with the discussion in Chapter 2.

Keep to adopt Inferential method

(Chapter 4 Methodology for dry deposition flux estimation in EANET)

4.1. Fundamental items of the Inferential Method in EANET

- Because the inferential method is the only method which is used for calculation in EANET, more description should be made focused on the inferential method in Chapter 4.1.

4.2. Parameterization of dry deposition velocity

- The description why these equations can be applied to dry deposition flux estimation in EANET should be added in Chapter 4.2.

Draft contents of the revised TMDDFE (3)

[The contents are followed by the current version.]

(Chapter 4 Methodology for dry deposition flux estimation in EANET, continued)

4.3. Computation of dry deposition flux

4.4. Evaluation of dry deposition flux determined by the Inferential Method

(Chapter 5 Future direction of dry deposition flux estimation)

- i. Determination of stability measurement method.
- ii. Selection of suitable site
- iii. Reconsidering reference height
- iv. Update parameterization in the future
- v. Elaboration of setting by using satellite data etc.

(Appendix I Future direction of dry deposition flux estimation)

(Appendix II Use of remotely sensed information)

→ These chapter should be moved to Appendices because they are not currently applied to the parameterization of the inferential method in EANET.

(Appendix III How to use dry deposition calculation software)

→ Dry deposition velocities and dry deposition fluxes for respective components will be automatically calculated by inputting the necessary data into macro program Excel file developed by the NC.

Schedule of TFMDD and EGRTM during 2021-2022

11 May 2021

2nd meeting of the EGRTM to review the 2nd draft of revised Technical Manuals and discuss on elaborated methods of dry deposition flux estimation and air concentration monitoring methods in East Asia

October 2021

Report the outcomes of the activities of TFMDD to the 21st Session of Scientific Advisory Committee (SAC21)

November/December 2021

3rd meeting of the EGRTM to review the 3rd draft of revised Technical Manuals

May/June 2022

4th meeting of the EGRTM to finalize draft of the revised Technical Manuals

July/August 2022

6th meeting of the TFMDD to review final draft of the revised Technical Manuals

September/October 2022

Submitted the final draft of the revised Technical Manuals to the 22th Session of Scientific Advisory Committee (SAC22) for adoption

Recommendations of the Task Force on MDD to SAC21

The 21st Session of the Scientific Advisory Committee of the EANET (SAC21) is invited to consider the report on the activities of the Task Force on Monitoring for Dry Deposition of the EANET by the Chair and Secretariat of the Task Force.